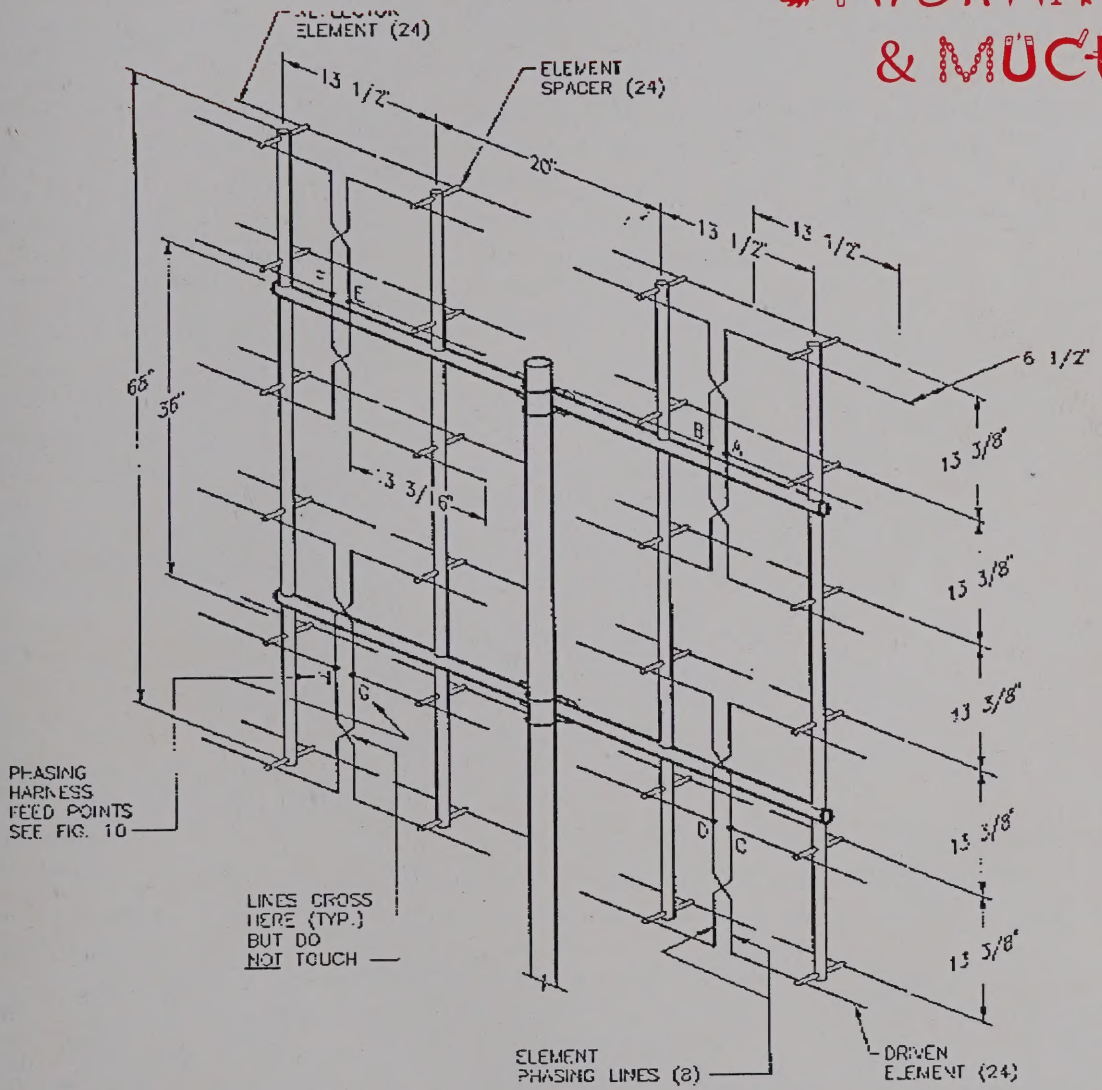
AMATEUR TELEVISION QUARTERLY

VOLUME 7 #3
SUMMER 1994

ISSN 1042-198X
USPS 003-353

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FIRST HAWAII TO CALIFORNIA ATV

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Times LMR600 Flexible Coax	1.8	2.6	3.1	4.3	0.59	$24.00	$1.45/ft.
Andrew 1/2" Superflex Hard-line	2.3	3.4	4.1	5.8	0.52	$37	$3.62/ft.
Belden 9913 Flexible Coax	2.8	4.2	5.2	7.6	0.41	$6	$0.69/ft.

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AMATEUR TELEVISION QUARTERLY

VOLUME 7 #3 SUMMER 1994

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Tidbits throughout our 68 pages!

NEW AT Q

Due to work assignments, 4 AM to 2 AM some days, 6-7 days a week, special live call-in program all month with a month long remote and a second special event all with 36 hours notice just as World Cup soccer starts! and other events, your scribe has been too busy to do much but eat and sleep. Even so, I've managed to get out another issue on time. Some items are missing this issue due to missed deadlines by contributors. They will return next issue. I also missed going to the summer CES show due to work, and the annual after Dayton report will be in next issue.

Also in this issue we have reprinted the transmitter diagram which was hard to read in the April issue. Last time we used our scanner to blow up the diagram and from the original printing. Through the digital process detail drops out. Dot matrix is the worst to work with, so kindly, no dot matrix diagrams! We will have the printer do it optically Don't forget this is a one man effort, no staff artists to redo what gets sent in. We are currently looking for larger home where I can put up bigger antennas and the wife can have a pet kennel business. So we may have news for the October issue.

Remember DEADLINE FOR OCTOBER ISSUE IS SEPT. 15, issue is mailed at the end of October.

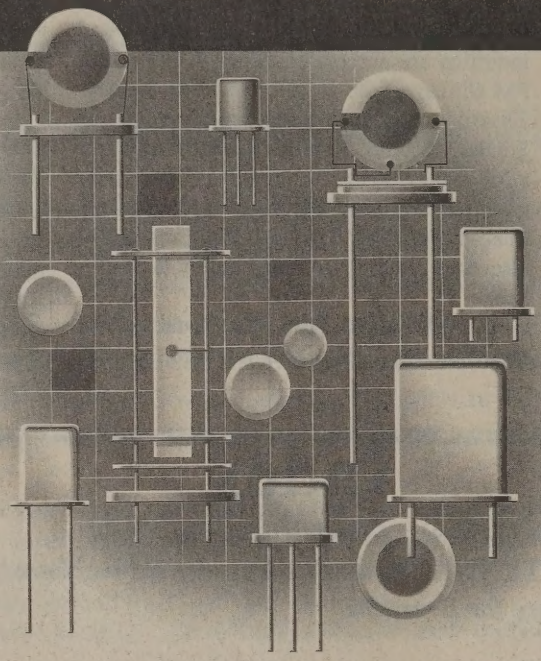
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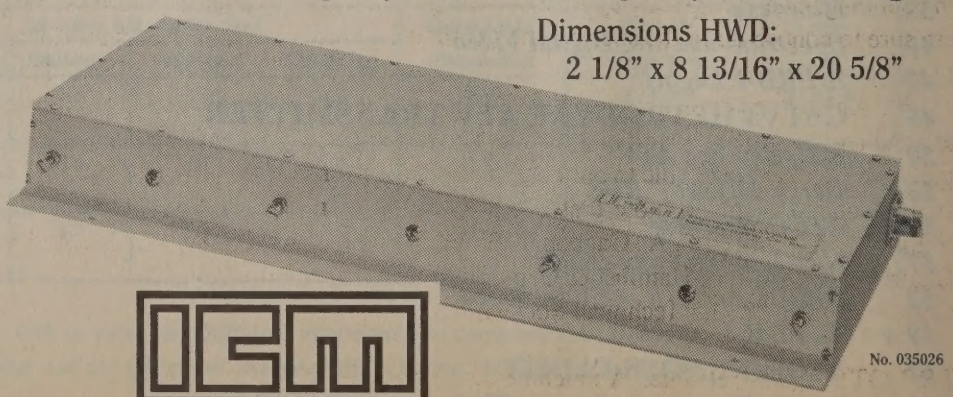
7-Pole Interdigital Vestigial Sideband Filter for Frequency Ranges of 420 MHz to 440 MHz

Ordering Information: The FL407 may be ordered on any frequency between 420 and 440 MHz. Please specify video carrier frequency when ordering.

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KEN & BILL GIVE ATCO DEMONSTRATION TALK TO CARA

On March 3rd Ken WA8RUT and Bill W8DMR gave a talk and demonstration at ATCO activity at the CARA (Columbus Amateur Radio Association) meeting. Ken did the major part of the talk which included our past, present and future planned activities with the ATV repeater assisted by Bill Parker on "the slide machine". Approximately 35 people were in attendance which, in my opinion, were very impressed and interested in our activity. The only exception occurred when Ken completed the talk and asked if there were any questions. The first question was "Are they going to have any bus transportation at the Dayton hamfest?" Well, almost everyone was interested in ATCO activity!!! At the end of the 45 minute talk, Ken and Bill showed everyone a first hand look at the repeater with a monitor on the front table. Although the sets' only antenna was rabbit ears, the signal was quite good. Our hats are off to Ken and Bill for going out of their way to promote ATCO activity.



The picture at the right was taken that evening while Ken and Bill are "doing their stuff". They're describing a simple commercial yagi antenna typical of what is required for ATV operation in Columbus.

I wonder if Bill is describing the feed mechanism of the antenna or simply telling Ken where the signal enters. It looks like a good place to fill in your own caption. Any suggestions? Art, WA8RMC *from ATCO Newsletter*

FT. WAYNE THANKS ATVQ!

This letter is to express our gratitude for both the coffee mug prize donations and the advertising for our event in your magazine. We greatly appreciate both gifts, as they are sure to contribute to the success and continued growth of our event.

Again, thank you very much, and if you would like to send any additional advertising handouts, we would be glad to make them available to our attendees. From a time frame standpoint, please note that our event is the third week of November. Don A. Gagnon WB8HQS, Hamfest Chairman, Fort Wayne Hamfest & Computer Expo, Allen County Amateur Radio Technical Society, Inc.

ED NOTE: Your welcome. A much better response than the DARA provided. see story elsewhere[DAYTON RIPOFF]

NEW ATV REPEATER SERVES WV OH KY

The OVWA, Ohio Valley Wireless Association, ATV repeater is on the air. The in-band repeater is located in Huntington, West Virginia serving parts of three states including Eastern Kentucky and Southern Ohio. The output is 421.25 Mhz and the input 439.25 Mhz. Monitor 145.45 Mhz Voice. Both tx and rx Antenna's are homebrew Dual slots made from the ATCO repeater slot designed by Art Towslee, WA8RMC. First repeater contact over 100 miles was Tom, WA8ZAH, located in Cincinnati, Ohio and Mike, KB8QEK, located in Huntington, WV. Ron Curry, WA4GSS

900 MHZ AMPS

Dear Henry:

Thanks again for the 900 Mhz amplifiers. They are quite a find. I appreciate you sending along the extra "junkers"-each have valuable parts that are quite useful.

As I mentioned on the telephone this evening, I have a copy of the installation/service manual which includes the schematic for the 45 watt amps. I also am including referencing sheets for the active devices, including the MRF894 pre-driver transistor found in the 100 watt units.

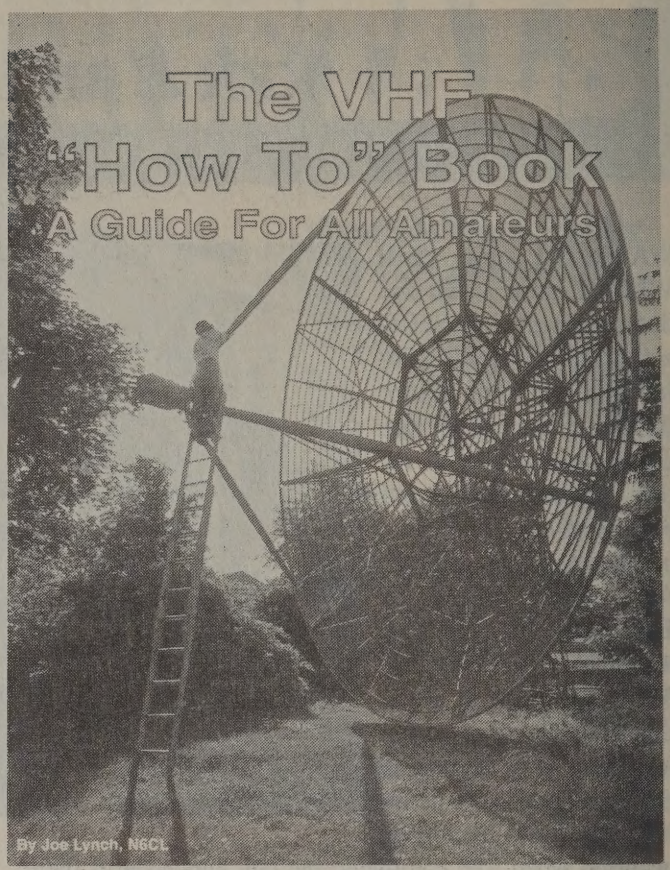
I hope to see you on the air. Rick Pemble WK8U, 110 Sceptre Dr., Rockwall, TX 75087

NEW VHF BOOKS FROM CQ

Hams who operate on the VHF & UHF bands now have two new valuable references available from CQ Communications, Inc. The titles are: Getting Started in VHF a new video program, and the VHF How-To book.

Getting Started in VHF by award winning writer/producer Richard Moseson, NW2L, offers a wide ranging introduction to the bands and activities above 30 MHz. Organized as a travel guide to VHF, the 52 minute program includes demonstrations of various features found on today's radios, instruction on how to find and use FM repeaters, the basics of packet radio and examples of making contacts via amateur TV, satellites, moonbounce and meteor scatter.

The VHF "How-To" Book, by CQ Magazine *VHF Editor Joe Lynch, N6CL*, is a comprehensive resource for both new and experienced VHF operators. It provides detailed guidance for all aspects of VHF operating and gives hams a single reference for the multitude of operating choices on VHF and UHF including ATV!



In addition to being CQ's VHF editor, author Joe Lynch, N6CL, is a leading VHF weak-signal operator, immediate past president of the Central States VHF Society, editor of the Quarter Century Wireless Association's QCWA Journal and Oklahoma Section Manager for ARRL.

Getting Started in VHF is the 7th CQ video produced by NW2L and the 6th program in the series, *Getting Started*. Moseson, a former CBS News producer, has won a variety of awards for his work, including recognition for CQ videos by The New York Festivals and the International Television Association. Moseson is also ARRL Northern New Jersey Section Manager and chairman of the ARRL Public Relations Committee.

Joe Lynch dropped by the ATVQ booth at Dayton and presented us with a copy of his excellent book for this review.

ATV'er CHOSEN AS ARRL ATLANTIC DIVISION "AMATEUR OF THE YEAR" AWARD

The 1994 ARRL Atlantic Division **"Amateur of the Year"** is **Bob Bennett W3WCQ**, of Towson, MD. This award is presented to an outstanding all-around amateur from the Atlantic Division with a strong record of service to the amateur community.

An active member of the **Baltimore Radio Amateur TV Society (BRATS)**, Bob co-anchors the popular "Answer Man Net" on the club repeater to help hams with technical questions. He has taught licensing courses and served as an Elmer to new hams.

Bob's particular technical specialty is **amateur TV**, and he has operated the **W3WCQ ATV repeater** for twenty years. It was only **the second ATV repeater in the world.**

Bob also takes part in public service communications; he serves on the planning committees for several local events served by hams, so that amateur communications **(sometimes including ATV)** are effectively integrated into management of the events.

For nearly ten years, Bob served at the Atlantic Division representative on the ARRL VHF/UHF Advisory Committee and served as the committee's last chairman. In 1993, VUAC was replaced by a new ARRL Spectrum Committee. In addition to being the Atlantic Division delegation's spokesperson, Bob was named chairman of the new committee by ARRL President George Wilson W4OYI. More than just an honor, this position represents a commitment to hard work on behalf of all users of the Amateur spectrum above 30 Mhz.

During more than 40 years as a ham, Bob has combined personal enjoyment of the hobby with service to others in a way that has earned the respect and admiration of others, in the Baltimore area and nationwide.

The award was presented at the ARRL Atlantic Division Convention, held in conjunction with the Rochester, NY Hamfest on May 21, 1994. Contact: Kay Craigie WT3P, 5 Faggs Manor Lane, Paoli, PA 19301-1905

ZL LAND ATV REPEATER

The Auckland ATV repeater ZL1BQ is back on air after a year's downtime. The results from the new exciter (a "Hills" brand, made for cable TV from Australia) and 2 Watt Class A linear PA (built by Wayne Griffin ZL1UJK) are better that I have ever seen from the old homebrew equipment. The input is 70cm (443.25 Mhz, note our ZL70cm FM repeaters use 433/438 Mhz). The output is in the 50cm band (615.25 Mhz) which is an amateur allocation in ZL. This is Channel 39E on TV sets, which is smack in the middle of the UHF TV broadcast band. The big networks still use the VHF band channels for their main transmissions. UHF is used for translators and PAYTV which is transmitted, to air, with the video scrambled. So a channel 39E output frequency provides an easy means for amateurs (and non-amateurs) to receive ATV. The sponsoring club, the Auckland VHF Group, Inc., would like the repeater to have a higher output power in the future, but the transistors are expensive (no power amplifier bricks available for 615 Mhz) so the target is a modest 10 Watts peak sync. The new video squelch unit responds equally well to 525 line 60 Hz NTSC signals, as the usual (for ZL) 625 line 50 Hz PAL signals, so tapes from all parts of the world may be played through it. The repeaters' receiver handles only 5.5 Mhz FM sound subcarrier, but as you get baseband audio from the VCR, this is not a problem when using a, made in ZL, transmitter for non-standard TV transmissions. Michael J. Sheffield ZL1ABS

HOG FENCE ATV ANTENNA

From The Printed Circuit, Lincoln Trails ARC

by KD4SHH

Steps For Building The Hog Fence Antenna

A. DRIVEN ELEMENT

1. Fashion and drill the 1" x 2.5" brass plate.
2. Bend the 1/8" x 36" brass welding rod in the center. Look at the diagram to make sure that the rod is bent into a "U" shape maintaining the proper 3/16" gap between the two 7.5" pieces.
3. BEFORE making the last two bends on the welding rod, slip the rod through the two holes in the brass plate. DO NOT solder it yet, just make sure it has a tight fit to facilitate future adjustments.
4. Prepare the two 5/32" x 12" pieces of brass tubing and slip them over the ends of the welding rod.

B. FEED LINE ASSEMBLY

1. Strip the end of the 3' coaxial cable as shown in the enlarged detail of the drawing. Solder the center conductor to the upper section of the U-bent rod and solder the braided shield to the lower section. Be careful not to melt the insulation on or inside the cable. Secure the cable to the lower section of the U bent rod with a black nylon wire tie.
2. Install the desired connector plug on the other end of the cable.

C. ASSEMBLING THE DRIVEN ELEMENT TO THE FENCE WIRE

1. Solder or braze the brass plate (and driven element) to the section of Hog Fence as shown in the diagram. Be careful not to damage the coaxial cable by allowing it to be heated excessively. Note that the openings in the fence are to be positioned with the narrow direction running vertically.
2. Use plenty of black nylon wire ties to attach the two 36" pieces of copper tubing to the rear of the fence. Bend the fence into the described parabolic shape using the measurements shown in the chart.

D. TUNING AND TESTING

1.. If your antenna is correctly assembled, it should be fairly close to being properly tuned already. The best way to tune an antenna is to transmit through it and adjust for minimum reflected power. This is not really critical here, unless you plan to transmit with this antenna.

2. To tune the antenna, slide the two 5/32" pieces of brass tubing on the ends of the U-bent rod to the suggested lengths. Now slide the entire element into and out of the brass plate. You will be able to use these three adjustments to optimize performance.
3. Once the antenna has been tuned, solder everything into place and re-check the parabolic shape.

E. INSTALLATION

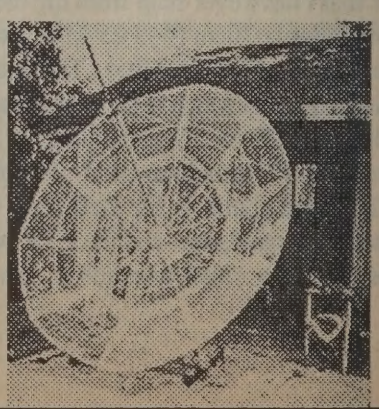
1. Install the antenna as high as possible, connect the best antenna cable you can afford, and point the open en of the parabola towards Sweat Mountain in Northern Cobb/Fulton county.
2. Tune in the signal and ENJOY!

WA6VZG BILL RYLAND THE MICROWAVE DISH BUILDER

Bill started working ATV after moving to Pine Grove in 1978.

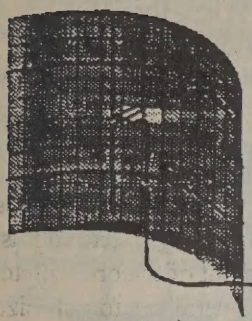
While working satellites, he became interested in ATV. Then he bought an ICOM 1271 and a downconverter to watch, but found that he needed a special antenna, so he built a 5' dish. Later he built his own 8'(26DB) and 10'(28DB) dishes. Since his Pine Grove QTH is 85 miles from the Mt, he needs all the help he can get.

Bill thinks ATV is a very social mode since you can see who you are talking to (sometimes). According to him, it keeps "old men off the streets and out of bars."



Pine Grove is near Jackson, about 85 miles to Mt. Diablo.

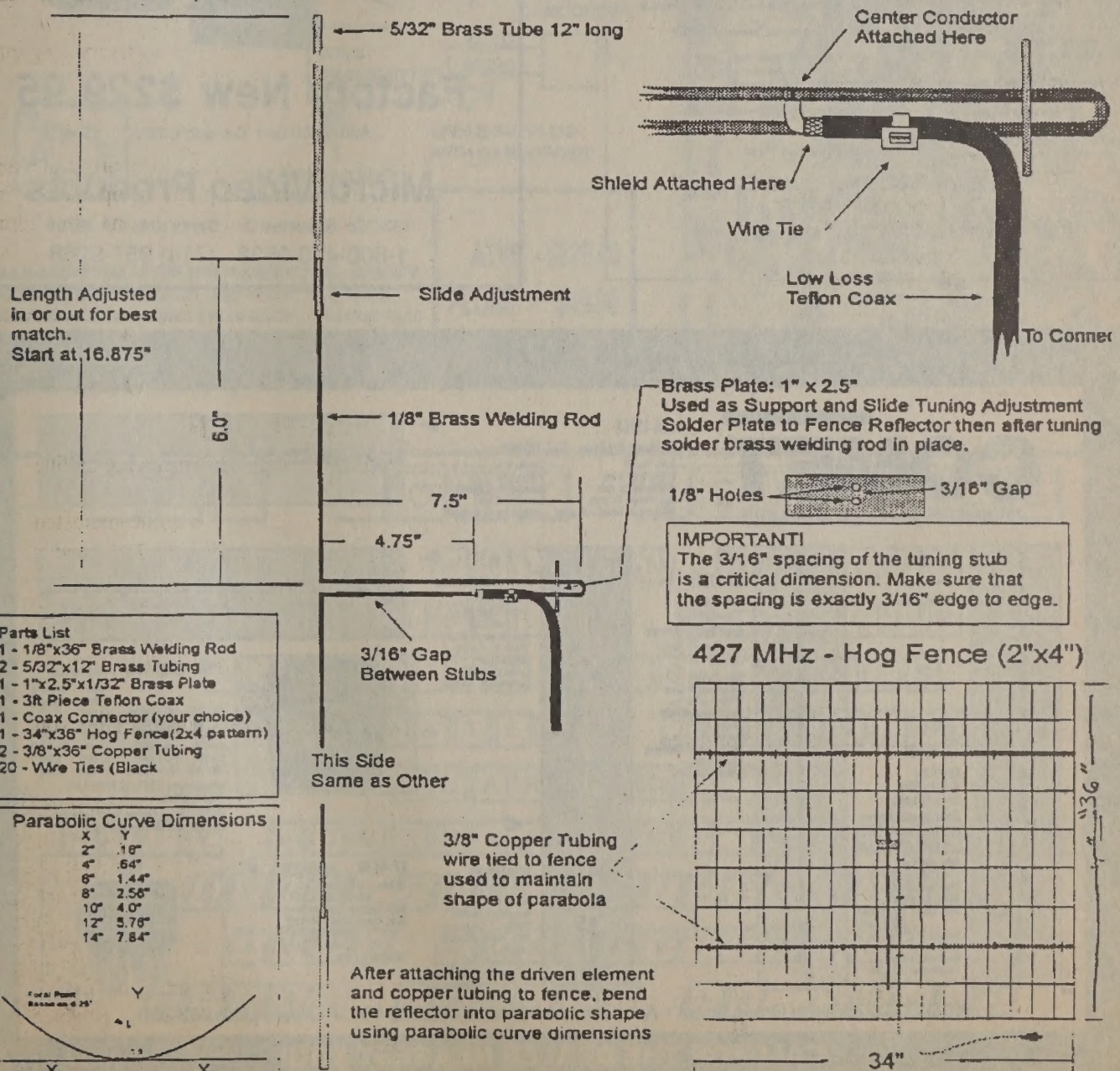
HOG FENCE ATV ANTENNA



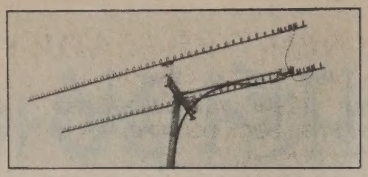
CHEAP & EASY HOG FENCE ANTENNA

by KD4SHH

This design is for basic experimentation with BSRG-ATV reception. Version 020994 - 427 MHz Colinear 2- 5/8 wave elements in phase with parabolic plane reflector.



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2345 LYK45el 1296 MHz 20 dBi $89
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3335 PA 10 in 40w out 900-930 MHz $320
23LNA preamp 0.7dB N.F. 1296 MHz $ 90
33LNA preamp 0.9dB N.F. 902 MHz $ 90

NEW PRODUCT ANNOUNCEMENTS

New Loop Yagis
1845 LY Loop Yagi 1691 MHz 20dBi $99
945 LY Loop Yagi 3456 MHz 20dBi $89
Above antennas assembled and tested

New Preamps

13LNA 0.7dB N.F. 12 dB 2.3 GHz $140
18LNA20 0.8dB N.F. 20 dB 1.69 GHz $140
SLNA 1.0dB N.F. 10 dB 2-2.7 GHz $150

New Wideband Power Amplifiers

2370 PA 3w in 70w out 1240-1300 MHz $695
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Rack mount Amplifiers for repeater use available.

NO TUNE MICROWAVE LINEAR TRANSVERTERS

From SHF SYSTEMS a new line of transverters designed by
Rick Campbell KK7B and Jim Davey WA8NLC

Available in kit form or assembled/tested

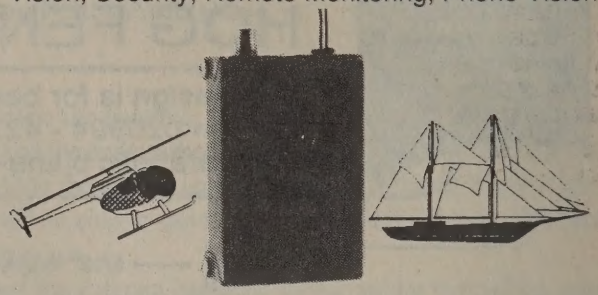
• 903 1269 1296 2304 3456 MHz
• microstrip filters eliminate tune-up
• 2m i-f, PIN diode switched
• sequencer standard in complete unit
• low profile packaging, mast mountable

All active equipment - 13.8V

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NTSC Output 240 TV Lines
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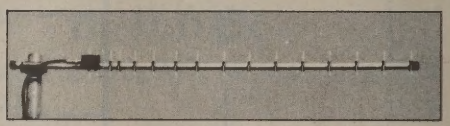


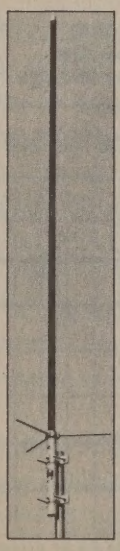
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VSWR: 1.5:1 or less
Impedance: 50 ohms
Max. Power: 100 watts
Polarization: Vertical or Horizontal
Length: 4' 5"
Weight: 7 lbs. 11 ozs.
Mounting Mast Diameter: 1"-2½"
Connector: N-Type
Construction: All Aluminum





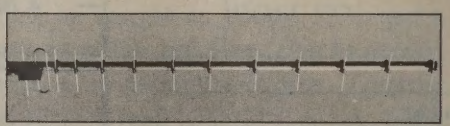
CA-1243Z
Dual Band
440-450MHz
1250-1300MHz
Base/Repeater Antenna
5/8 Wave x 4 446MHz
5/8 Wave x 9 1200MHz
Gain: 446 9.4dB, 1200 12.8dB
Impedance: 50 ohms
VSWR: 1.5:1 or less
Max. Power: 446 150 watts, 1200 50 watts
Length: 7' 5"
Weight: 2 lbs. 8 ozs.
Connector: N-Type
Construction: Heavy Duty Fiberglass

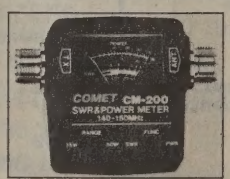


CA-1221S
Mono Band
1260-1300MHz
Base/Repeater Antenna
1/2 Wave 21 Step Collinear
Gain: 15.5dB
Impedance: 50 ohms
VSWR: 1.5:1 or less
Max. Power: 100 watts
Length: 8' 6"
Weight: 2 lbs. 3 ozs.
Mounting Mast Diameter: 1¼-2½ inches
Connector: N-Type



PYA-913
Base 13 Element Yagi
904-920 MHz
Gain: 15.8dBi F/B ratio over 20dB
Max. Power: 150 watts
VSWR: 1.5:1 or less
Length: 4' 8"
Connector: N-Type
Construction: Aluminum





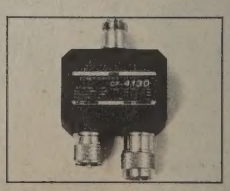
MINI SWR Power Meters

		Max. Power	Insertion Loss
CM-200	140-150MHz	45 watts	0.1dB
CM-300	200-240MHz	60 watts	0.2dB
CM-400	420-460MHz	50 watts	0.2dB
CM-420	140-460MHz	50 watts	0.1-0.2dB
CM-900	840-950MHz	60 watts	0.2dB
CM-1200	1225-1325MHz	60 watts	0.25dB

Measurements: 2.25"w x 2.25"h x 1.1"d
Weight: 5.25 oz.
CM-200, 300 and 400 have SO 239 Connectors
CM-420, 900 & 1200 have N Connectors

FP-19
Base/Repeater
905-925MHz
Gain: 16dBi
Impedance: 50 ohms
VSWR: 1.2:1 or less
Max. Power: 100 watts
Length: 7' 4"
Connector: N-Type
Construction: Heavy Duty Fiberglass

CF-4130 446/1200MHz
dB Loss: 1.3-460MHz 0.2dB, 900-1400MHz 0.3dB
Band Rejection: 55dB Down
Max. Power: 146MHz 800W PEP, 446MHz 500W PEP, 1200MHz 200W PEP
Connectors: N-Type



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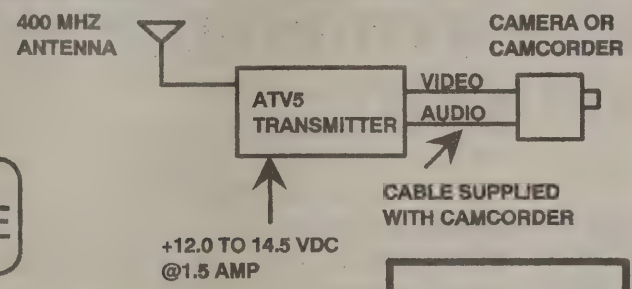
ATV ELECTRONICS

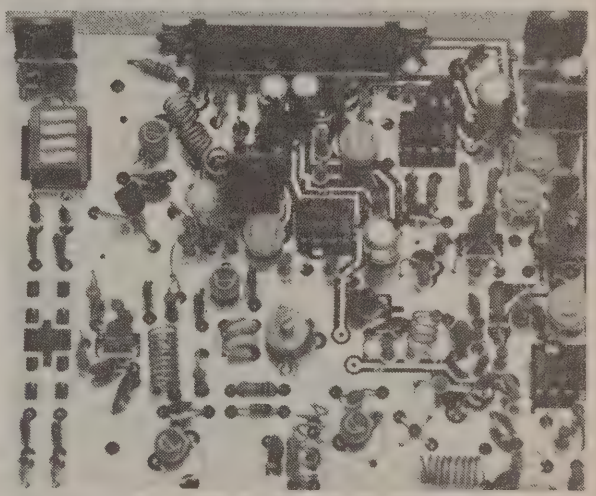
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- O 300 VOLT/uSEC VIDEO !
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- O POWER MODULE ON THE BOARD !
- O LINEAR MODULATION WITH OP AMP!
- O ONLY 5 TUNING CAPS FOR 400 MHZ !
- O INCLUDES AUDIO SUBCARRIER GENERATOR !
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PLL4.5 - $49.00

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STS-62 MISSION MARCH 5-19, 1994
STS-59 APRIL 7 FOR 9 DAYS
STS-64 IN SEPTEMBER FOR 9 DAYS

This project is dedicated to the memory of Tim Mallory, AI4B. With permission from NASA and a special ruling by the FCC, we televise missions to HAM operators on the Big Shanty Repeater Group's ATV Repeater.

AUDIO & VIDEO RECEPTION REQUIREMENTS & INSTRUCTIONS

What Video We Transmit:

We are transmitting to Amateur Radio Operators via the hobby of Ham Television, all video from the Space Shuttle and Mission Control. Our transmissions begin just prior to launch and run continuously until just after landing back on Earth. Our transmitter site is at Sweat Mountain (corner of Fulton, Cherokee, and Cobb Counties) and Effective Radiated Power is 1050 watts. Coverage is continuous audio and video on 427.250 Mhz (CATV channel 58) Fast Scan Amateur Television.

How To Receive The Video:

To avoid later disappointment, please understand that our signal is many, many times less powerful than a "normal" TV station. To receive it outside a radius of about 50 miles is nearly impossible without a good antenna mounted high. If you want to attempt it, start with the most critical part of the installation; the antenna. Your receiving antenna must be a good, directional type UHF antenna capable of receiving a fringe-area signal. Mount it as high as possible and away from trees. For best results, mount the antenna on its side, with the metal rods, or elements, oriented vertically, not horizontally, as with a standard TV antenna. Aim the antenna towards Woodstock, GA. An outside TV antenna with a nice UHF section (the really short 6"-8" pieces) may work. Some folks have had reasonable luck with the Radio Shack U-75 or U-100.

For optimum results, use a Ham type antenna that is optimized for the 427 Mhz frequency that we use. Enclosed are plans to build what we know as the "Hawg Fence" antenna, named after the fence wire that is used for the rear reflector. It can be made with hobby shop and Home Depot parts and performs nicely. This antennacan be built for less than $5.00. If the TV type antenna doesn't perform well for you, and you aren't able to build an antenna, then we suggest a commercially made Swiech or KLM antenna available by mail from a company called PC Electronics in Arcadia, CA (818) 447-4565. See the other side for excerpts from their catalog. Cost is around $59.00.

While at the antenna, you may wish to install a small preamplifier to boost the signal. Again, we look to Radio Shack for a low-cost solution; their model 15-117 is an outdoor mounted preamplifier that does a reasonably good job at this.

SHUTTLE COVERAGE

The Antenna Wire:

The second most important part of this project is the wire that is used to bring the signal into your receiver. It should be "coaxial cable" and should not be the regular TV type known as RG-59. This cable has a lot of internal resistance to our signal. Unless your cable is to be very short, 10 feet or less, do not bother with this type. A better choice is the RG-8 type cable used on two-way radios. The best cable for the job is called 9913 and is available from several sources, including Ham Radio Outlet on Buford Highway in Doraville (phone 404-263-0700). Beware that this cable goes for around 70 cents per foot. Whatever cable you choose, be sure to pick up the proper connectors or adapters to connect the ends to your antenna and receiver! The "hawg fence! antenna is usually constructed with a TV type "F" connector, the KLM antenna has an "N" connector, and the PC electronics down converter requires an "N" connector on its cable.

What We Use As A Receiver:

Many folks are using a cable-ready television set or VCR to receive our signal. The unit must be able to tune to channel 58 when in the CATV mode. We must repeat that whether you choose a cable converter, a cable ready set or a cable ready VCR, it must be able to tune to CATV channel 58. Please note that we are not talking about UHF channel 58. Your TV must "think" that it is receiving CATV 58, when in reality it is picking up our signal over the air.

If you have no cable-ready receiver, a low cost amplified receiver (called a down-converter) is available from a Company called PC Electronics. They charge about $49.00 for a kit and $89.00 for a fully assembled unit. This unit will convert our signal to channel 3 or 4 on a TV, much like a home video game.



NO, IT'S NOT A NEW F.C.C. REGULATION--IT'S MY REGULATION, AND SHE GETS COVERED UP!

For Hams:

If you already have a HAM type UHF beam antenna, and it is vertically polarized, it will probably work just fine. If you must convert your PL-259 to an F connector, you may use two adapters from Radio Shack. Their part numbers are: 178-255 for $1.29 and 278-208 for $1.79.

Audio Reception Instructions (For Those Who Can't Receive the Video)

We also provide the voice portion of the program on a frequency of 147.345 Mhz. This is know as a Ham radio repeater. This is easily received on most scanner radios. When NASA missions are not on, local Ham operators may be heard here pursuing their hobby and doing public service. If you are more than about 30 miles from Marietta, or have a bad location or metal building, your scanner may need a better antenna then the built-in one. Stores such as Radio Shack have a good selection. If the 147.345 signal is not on, try listening to our back-up transmitter on 146.655 Mhz.

Information Forum:

We hold an Information Forum (or "NET") every Thursday night at 9 p.m. You will find Hams watching, listening, and participating in it on 146.655 Mhz voice or on the ATV repeater. Sometimes we show equipment, videos, give training and sometimes just chat (or "rag chew" as the Ham radio operators call it). You are welcome to eavesdrop.

If you aren't a Ham Radio Operator, and would like to become one or just learn more about our hobby, then you are welcome to pick up a copy of the book "Now You're Talking" at Ham Radio Outlet or your local Radio Shack. This guide helps you obtain your no-code required Technician class Ham license. When ready to take yourexam, call our information line listed at the beginning of this handout. The recordings will tell you where and when the closest testing session is to you.

CAATN MEETING MARCH 6, 1994

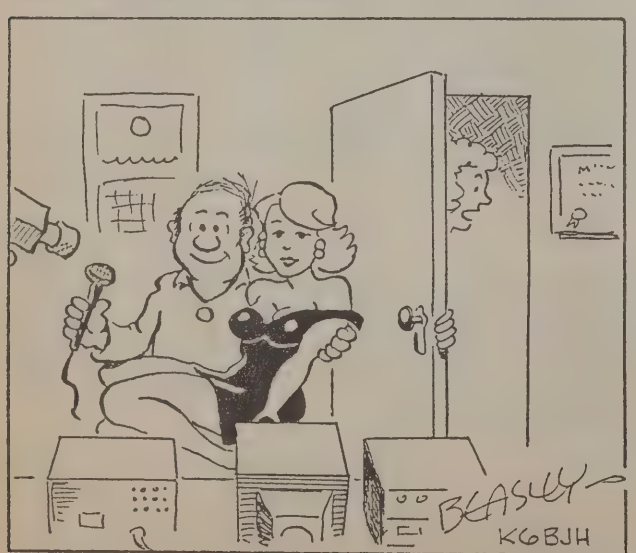
John Jaminet W3HMS

The most recent meeting of the Central Atlantic Amateur Television Network (CAATN) was held Sunday, March 6, 1994 at Poor Jimmy's Restaurant in Northeast, MD. The session was conducted by our Chairman, Ron Cohen, K3ZKO, Captain Video Emeritus, of Philadelphia. The proceedings were taped by Bob Storm, WB3EAF for CAATN use and by John Jaminet, W3HMS for overseas ATVers following the approach started at York in September 1993 and continued on November 28, 1993.

The results of recent repeater interlinking tests and controls between Baltimore, MD and York, PA were presented by Bob Storm, WB3EAF and Heru Walmsley, W3WVV. This is the start of repeater interlinking between these two cities but all current operation is only in a manual test mode. Then Mike Dees, N3EZD and Bob Koblish, N3HAT presented the VS-100 controller and told how to make it even better. They showed accessory equipments built by the Baltimore technical group for use on their repeater. After another superb lunch by Poor Jimmy's, Russ Barber, N3HPX gave a talk and demonstration on picture quality versus P level as related to the signal threshold in FM ATV. Following Russ, John Jaminet, V3HMS presented a 15 minute video tape provided by Michel Vonlanthen, HB9AFO, of Bussigny, Switzerland and professionally converted from PAL to NTSC by Pierre Binggeli, HB9IAM of Geneva. The tape visually told the story of the TV9CEE/P ATV Assent on Mont Blanc in France in August 1992. The scenery was beautiful and the ATV activity was at a very advanced level.

Next, Bob Bennett, W3WCQ presented a demonstration of the attenuation at ATV frequencies caused by using various popular coaxial connectors used by hams. Repeater frequency coordination is a subject of no small interest to ATV hams and Gary Hendrickson, W3DTN of T-MARC gave us a briefing on the history of repeater coordination in the Baltimore area of Maryland. We concluded our technical topics with Bob Bennett, W3WCQ, informing us of his new assignment as Chairman of the ARRL Spectrum Management Committee.

For information to prospective members, the dues for 1994 are $5.00. Paul Seman, W3CSU is the Treasurer and John Shaffer, W3SST is the Newsletter Editor. The Philadelphia will be responsible for the July 17, 1994 meeting. The 1994 meetings of the CAATN are targeted for the following Sundays, July 17 and November 27 atPoor Jimmy's in Northeast, MD and Saturday, September 24 in York, PA. If you have questions, please contact Ron Cohen, Chairman, K3ZKO of Philadelphia of John Jaminet, Vice Chairman, W3HMS (@K3WKK packet) of Mechanicsburg, PA. "30" and 73. John, W3HMS



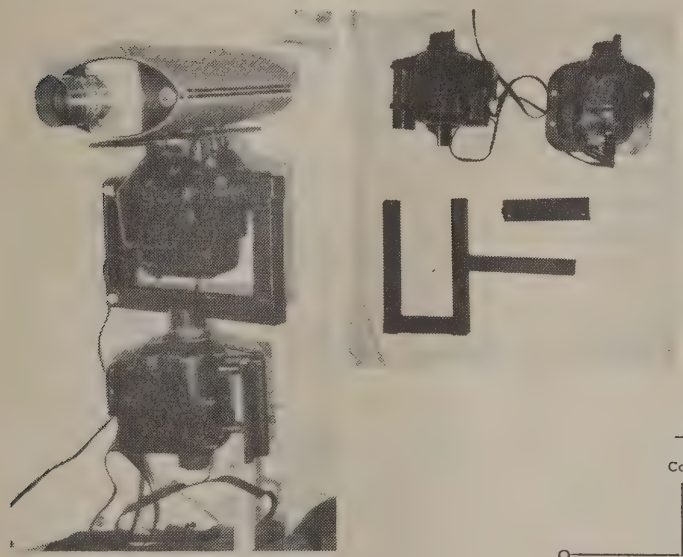
DEAR, SOME LITTLE GIRL FROM DOWN THE BLOCK PHONED EARLIER AND SAID YOU PROMISED TO SHOW HER THE ROPES ABOUT ATV

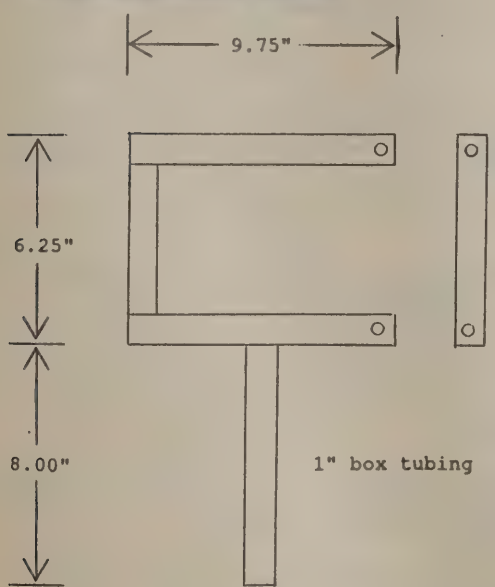
ELIZABETHTOWN, KY ATV RPT

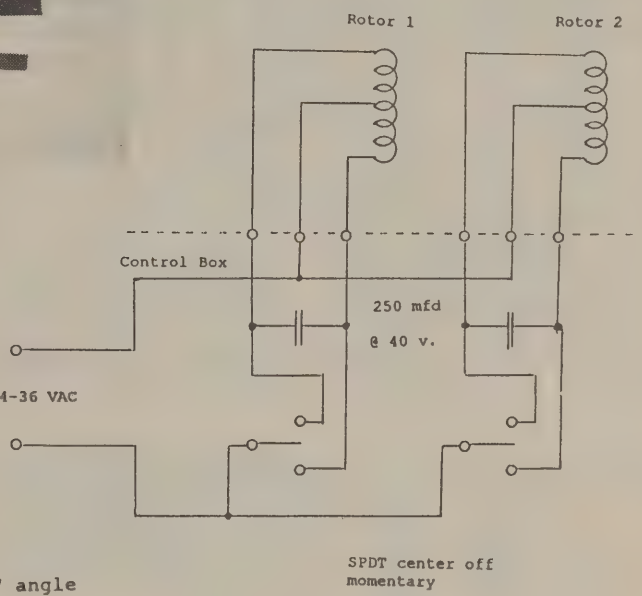
The ATV antenna is up on the 200 foot tower and the ATV repeater is working GREAT. K4VXP in Cambellsville gets into it like he was in town. Also Hank W4HTB in Bowlingreen is getting into it very good. Put your TV set on CH. 57 and put an antenna in place of the cable and you should be able to see it.

REMOTE PAN AND TILT

Bob WD5BJW







This is an inexpensive pan and tilt unit suitable for small cameras. It is built from two common U-100 rotors available at garage sales or hamfests.

The trick is to mount the tilt rotor's shaft stationary and rotate the housing. This allows the motor housing to act as the counter weight. The first rotor is used in conventional fashion providing the pan function.

To begin assembly, cut off the top plate, mounted at one end of the bolt pattern, this allows a 4 by 7 inch plate to be mounted flat on the four bolts protruding from the case. Cut off excess length of bolts, this gives you a flat surface for mounting the camera housing using pipe straps or screws.

Clamp the rotor shaft to the tubing with hose clamps if the original U bolts are missing. I welded my bracket together but it could be assembled with nuts and bolts. The control box was built from scratch with parts from the junk box, but if you can pick up the U-100 control box, most of the parts can be salvaged from there. I used a joystick from the junk box, although they can be found at some mail order houses. Any momentary contact center off switch can be used. 73 Bob WD5BJW

Indiana Repeater Council

July, 1992

The following Bandplans have been accepted for use in Indiana:

420 - 450 MHz.

420.000 - 432.000	EXPERIMENTAL & ATV	(Note #1)
432.000 - 432.100	EME	
432.100 - 432.300	SSB (432.100 National Calling Channel)	
432.300 - 432.400	BEACONS	
432.400 - 432.975	MIXED WEAK SIGNAL	
433.000 - 433.150	LINKS, AUXILIARY	(Note #2)
433.175 - 433.625	PACKET DUPLEX HI SPEED NETWORK	(Note #3)
433.675 - 433.800	LINKS, CONTROL, AUXILIARY	(Note #4)
433.825 - 435.000	WEAK SIGNAL EXPERIMENTAL	(Note #5)
435.000 - 438.000	SATELLITE (Worldwide)	
438.000 - 444.000	ATV (439.275 MHz. Video Input Req'd)	(Note #6)
442.000 - 444.975	FM REPEATER OUTPUTS	(Note #7)
445.000 - 445.150	SIMPLEX PACKET	(Note #8)
445.175 - 445.625	PACKET HI SPEED, LINKS, CONTROL, AUX.	(Note #9)
445.675 - 446.975	LINKS, CONTROL, AUXILIARY	(Note #10)
447.000 - 449.975	FM REPEATER INPUTS	(Note #11)

Repeater Pairs	(high in/low out)	(120 total)
447.000/442.000	448.000/443.000	449.000/444.000
447.025/442.025	448.025/443.025	449.025/444.025
.	.	.
447.975/442.975	448.975/443.975	449.975/444.975

902 - 928 MHz.

902 - 904	NARROW BANDWIDTH, WEAK SIGNAL
904 - 906	DIGITAL COMMUNICATIONS
906 - 907	NARROW BANDWIDTH FM SIMPLEX
907 - 910	FM REPEATER INPUTS
910 - 916	ATV OUT
916 - 918	DIGITAL COMMUNICATIONS
918 - 919	NARROW BANDWIDTH FM, LINKS
919 - 922	FM REPEATER OUTPUTS
922 - 928	ATV IN

1240 - 1300 MHz.

1240 - 1246	ATV
1246 - 1248	NARROW BANDWIDTH FM, DUPLEX 1
1248 - 1252	DIGITAL COMMUNICATIONS
1252 - 1258	ATV
1258 - 1260	NARROW BANDWIDTH FM, DUPLEX 1
1260 - 1270	SATELLITE UPLINKS
1270 - 1276	REPEATER INPUTS 2
1276 - 1282	ATV
1282 - 1288	WIDE BANDWITDTH WEAK SIGNAL
1288 - 1290	NARROW BANDWIDTH WEAK SIGNAL
1290 - 1296	REPEATER OUTPUTS 2
1296 - 1300	DIGITAL COMMUNICATIONS

IRC MACC

NOTE #1 To be utilized for any experimental activities, the output of ATV repeaters, etc. Interference studies indicated that the output of the Indianapolis ATV repeater, operating on 425.250 MHz. (USB only transmitted), when viewed by typical users was interfered with by a low power (15 Watt) signal operating in the range of 423.1 - 431.8 MHz. ATV Repeater output at 425.250 results in strong output signals at 432.410 (2X color) and 434.250 (2X sound).

NOTE #2 6 Channels spaced 25 KHz. beginning on 433.000 MHz. (This signal would extend down to 432.995 MHz.) The last usable channel would be 433.125 MHz. Signal width typically +/- 5 KHz.

NOTE #3 10 Channels spaced 50 KHz. beginning at 433.175 MHz. (This signal could extend down to 433.150 MHz.) paired with channels beginning at 445.175 MHz. Bandwidth determined by baud rate and future technology.

NOTE #4 6 Channels spaced 25 KHz. beginning at 433.675 MHz. Signal typically +/- 5 KHz.

NOTE #5 Signals in this area may cause interference to or receive interference from ATV signals.

NOTE #6 439.275 MHz. video input results in the following strong signals that may interfere with other modes of communications: 430.275(2X Sound), 432.115(2X Color), 434.775(Sound), 435.695(Color), 439.275(Video), 442.855(Color), 443.775(Sound), 446.435(2X Color), 448.275(2X Sound).

NOTE #7 The present Repeater Bandplan allocates 120 channels on 25 KHz. spacing, high in/low out with 5 MHz. offset.

NOTE #8 7 Channels spaced 25 KHz. beginning at 445.000 MHz.

NOTE #9 10 Channels spaced 50 KHz. beginning at 445.175 MHz. (This signal could extend down to 445.150 MHz.) paired with channels beginning at 433.175 MHz. Channels and Bandwidth determined by baud rate and future technology. Upper Channel bandwidth could extend to 445.650 MHz. Packet use requires coordination by the Council in the same way as any link request.

NOTE #10 13 Channels spaced 25 KHz. beginning at 445.675 MHz. Bandwidth typically +/- 5 KHz.

NOTE #11 The present Repeater Bandplan allocates 120 channels on 25 KHz. spacing, high in/low out with 5 MHz. offset.

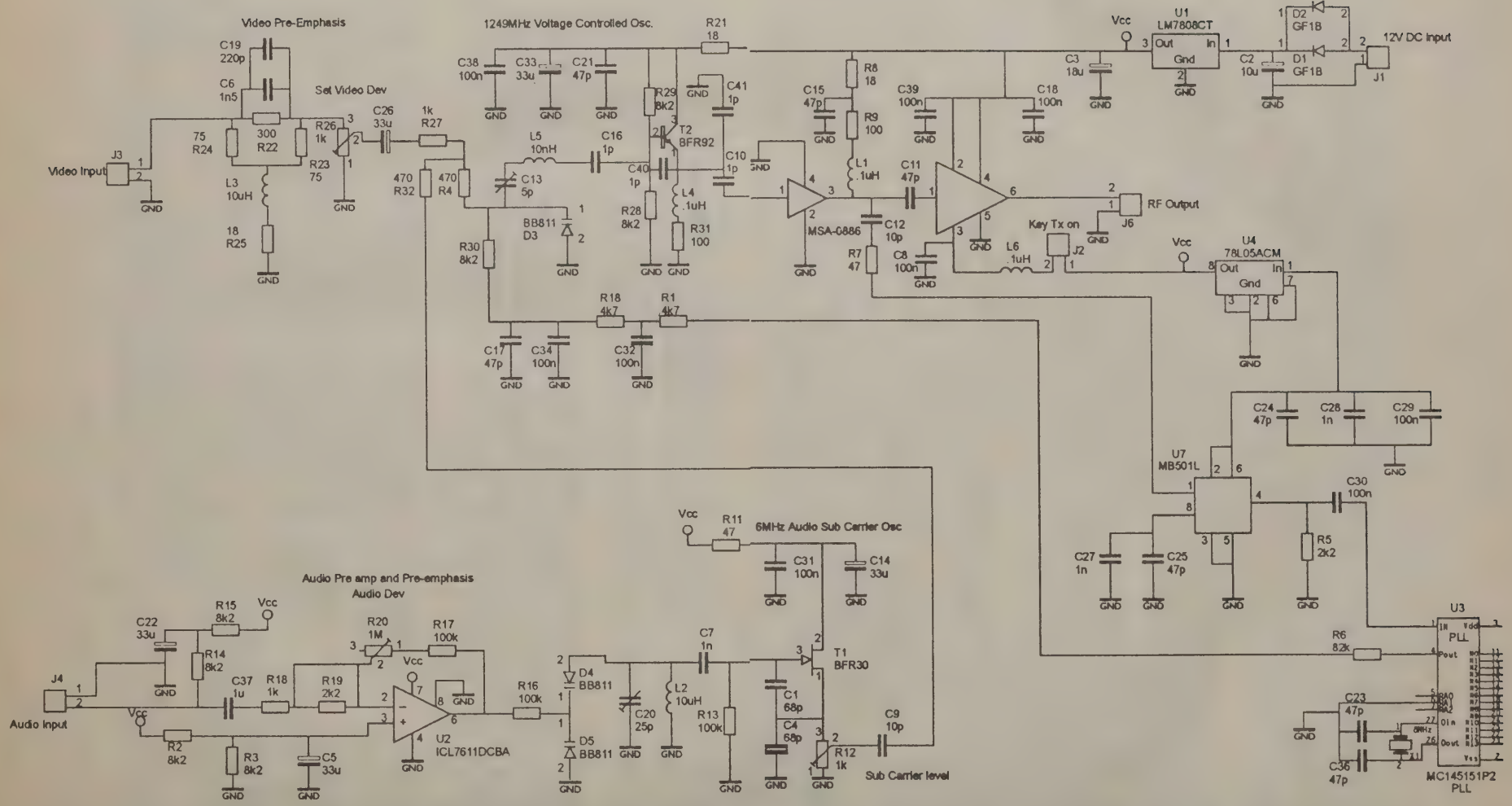
ADDITIONAL NOTES:

1) The 443.275/448.275 Repeater Channel is not available due to the 2X Sound carrier.

2) The 442.850 and 443.775 Repeater Outputs may be subject to interference from color and sound carriers of ATV user transmitters.

3) The 446.425 and 446.450 MHz. Link channels may be subject to interference from the 2X Color ATV carrier.

24 cm ATV Transmitter
Diagram reprint, from April 94 issue



A 439MHZ 48 ELEMENT COLINEAR ANTENNA FOR THE PUREST...WELL ALMOST!

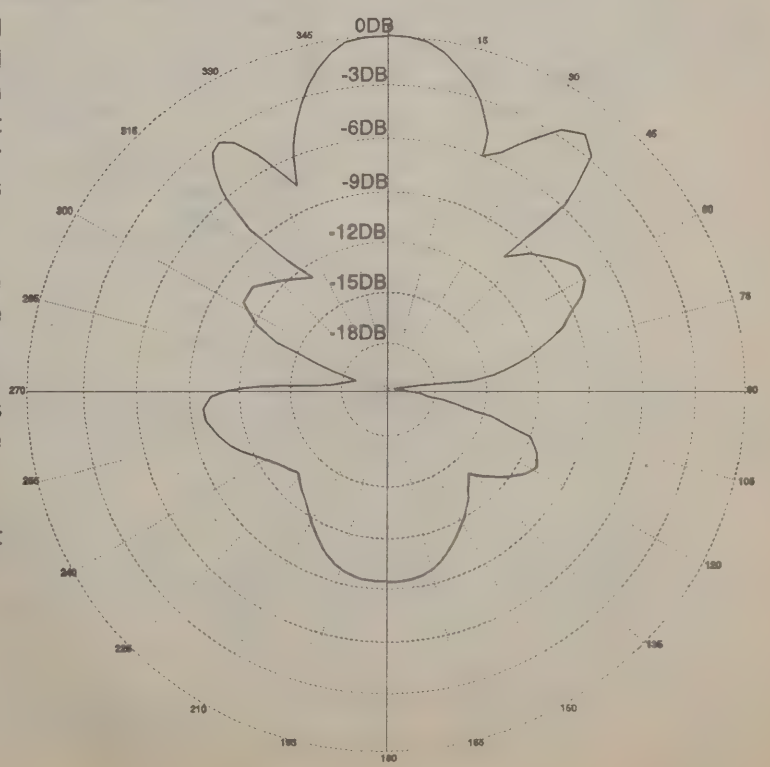
Let's try to break away from repeater thinking for just a little while. I promise you that if I could convince everyone to build one of these antennas, we wouldn't need repeaters! Well not quite, but this antenna speaks quite well for itself. Yes, it does take up more space on the mast than many others but if you have the room to spare you'll find that the construction effort is well worth the time. The antenna is basically 12 sets of 1/2 wave driven elements with reflectors all fed in phase (driven in parallel). Since each set of dipoles has a feed impedance of around 1200 ohms, the parallel combination equals about 100 ohms which is easy to match to a 50 ohm transmission line as shown below. I highly recommend this antenna for ATV work.

Its main features are high gain (16dbd), easy to construct with readily available materials, no special high tech tools to build it and it is very tolerant of sloppy construction practices. In fact, if some dimensions are staggered just a little (don't get carried away) the gain sacrifice is very slight but the bandwidth is enhanced significantly. Additionally, because it is a very low Q antenna, its natural bandwidth is much greater than any yagi and the low SWR during rainy conditions is tolerable (yagis are only fair weather antennas). I've built a number of these antennas and can speak with experience. I used to have 2 of them (96 elements) one over the other for over 10 years working great till the plastic became too brittle and started breaking with the weight of the birds.

Construction is straightforward and I feel self explanatory in the following figures. The feed point is around 90 to 100 ohms (measured) which lends itself to a 2:1 balun for 50 ohm transmission line applications. Or if you build two and center feed the combination, all that is needed is a balance to unbalance stub (Pawsey stub) to directly feed the 50 ohm antenna to a 50 ohm transmission line. Be sure to follow the connections for the phasing harness correctly because this is where most errors occur. If somewhere in the construction the phasing harness gets miswired, usually the antenna pattern main lobe has a big notch in it. The overall design of this antenna is not new but I believe that the construction technique is novel in as much as the antenna elements are supported at the low voltage points achieving low loss and resulting in higher gain for a longer time than would normally be realized with conventional commercial methods.

The dimensions shown are proper for a center frequency of about 435Mhz with more than a ±6Mhz 3DB bandwidth. At 435Mhz I've measured the gain to be 16.5DB referenced to a dipole. This represents a good choice for 439Mhz ATV simplex activity while still maintaining good gain for ATV repeater receive activity on 427Mhz. Trying to get any yagi to perform this task would be a never ending frustrating chore.

The figure to the right is the actual plotted pattern of the antenna. Note the rather broad front lobe. This is good because it allows non critical antenna positioning. However, the front to back ratio is not as good as a yagi so if your main goal is to attenuate signals at the back, it's not the antenna for you.



On the following two pages the complete construction details are outlined. The first page shows an isometric view of the completed antenna without the feed harness for simplicity. The feed harness connects to the points indicated with the coax feed in the center of the harness.

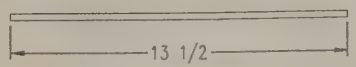
The next page details the individual component parts that go into the completed design.

Happy building!!!

Art...WA8RMC

FIG. 1 REFLECTOR ELEMENT

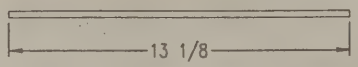
24 PCS. REQD. (27+ FEET TOTAL)



MAKE FROM .145" DIA ALUMINUM CLOTHESLINE

FIG. 2 DRIVEN ELEMENT

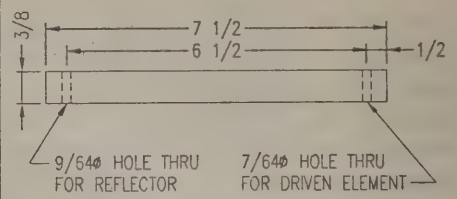
24 PCS. REQD. (26 1/4+ FEET TOTAL)



MAKE FROM 1/8" OD 1/32" WALL BRASS TUBING. CLEAN OUT BURRS FROM INSIDE OF ONE END FOR PHASING LINE.

FIG. 3 ELEMENT SPACER

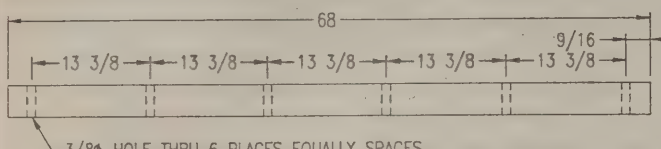
24 PCS. REQD. (15+ FEET TOTAL)



MAKE FROM 3/8" DIA NYLON ROD

FIG. 4 ELEMENT SPACER HOLDER

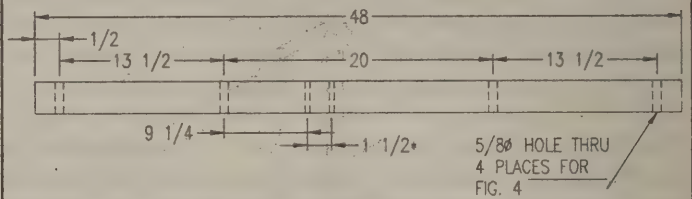
4 PCS. REQD. (4 10' LENGTHS)



MAKE FROM 1/2 NOM. CPVC PLASTIC WATER PIPE (1/2 ID & 5/8 OD)

FIG. 5 HORIZONTAL BAY SUPPORT

2 PCS. REQD. (8 FEET TOTAL)

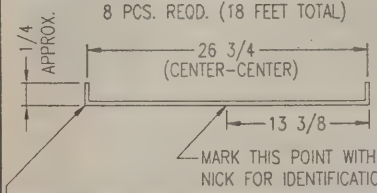


* 2 HOLES IN THE CENTER TO MATCH THE TYPE OF MAST CLAMP USED

MAKE FROM 3/4" SCH. 40 PVC PLASTIC PIPE (13/16" ID & 1 1/16" OD)

FIG. 6 ELEMENT PHASING LINES

8 PCS. REQD. (18 FEET TOTAL)

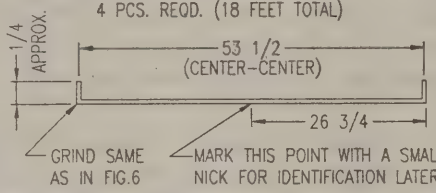


GRIND OR FILE ENDS SLIGHTLY TO REDUCE DIA & MAKE AN EASY FIT INTO ELEMENTS. HEAT ENDS TO GLOW WITH PROPANE TORCH BEFORE BENDING & BEND HOT TO PREVENT COLD FORMING BREAKAGE.

MAKE FROM 1/16"ø BRASS WELDING ROD (THIS MATL. NORMALLY COMES IN 36" LENGTHS)

FIG. 7 VERTICAL BAY PHASING LINES

4 PCS. REQD. (18 FEET TOTAL)

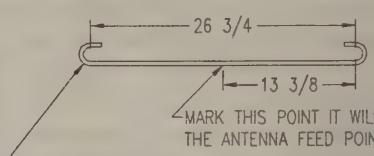


(THIS REQUIRES BRAZING 2 PIECES TOGETHER – USE PROPANE TORCH, SEARS CRAFTSMAN #9-2056 FLUX & VICES TO HOLD PIECES – GRIND SMOOTH AFTER BRAZING.)

MAKE FROM 1/16"ø BRASS WELDING ROD

FIG. 8 HORIZONTAL BAY PHASING LINE

2 PCS. REQD. (53 1/2" TOTAL)

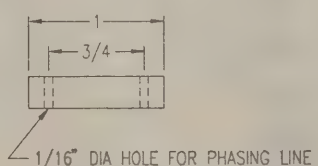


BEND IN A LOOP SO THE CENTER OF THE VERT. BAY PHASING LINES PASS THRU. HEAT FIRST AS FOR ELEMENT PAHSING LINES.

MAKE FROM 1/16"ø BRASS WELDING ROD

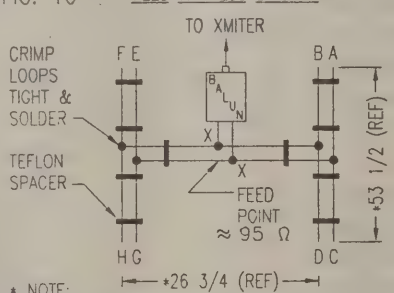
FIG. 9 PHASING HARNESS SPACER

10 REQD. (10" TOTAL)



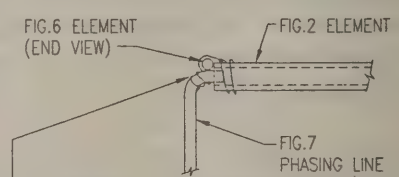
MAKE FROM 1/4"ø TEFLON ROD.

FIG. 10 FEED HARNESS DIAGRAM



* NOTE: THESE ARE LINE LENGTHS & NOT ACTUAL ELEMENT SPACINGS. HARNESS LOOPS OUT IN FRONT OF ANT.

FIG. 11 FEED HARNESS ELEMENT PHASING HARNESS CONNECTION METHOD



WRAP 2 TURNS ON EACH LINE & ON ELEMENT WITH #20 OR #22 BARE COPPER WIRE TIGHTLY & SOLDER

FIG. 12 MATCHING BALUN

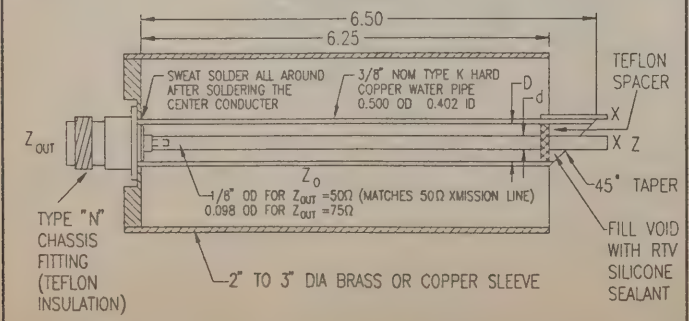


FIG. 13 BALUN CALCULATIONS

Z_O =1/4 λ LINE SECTION IMPEDANCE
Z_{IN} = ANTENNA FEED IMPEDANCE.
Z_{OUT}= TRANSMISSION LINE IMPEDANCE

$Z_O = \sqrt{Z_{IN} Z_{OUT}}$

λ (inches) = $\frac{11.80}{\text{freq.(gigahertz)}}$

$Z_O = \frac{60}{\sqrt{e}} \ln\frac{D}{d} = \frac{138}{\sqrt{e}} \log_{10}\frac{D}{d}$

e = DIALECTRIC CONSTANT (air=1 teflon = 2.1)

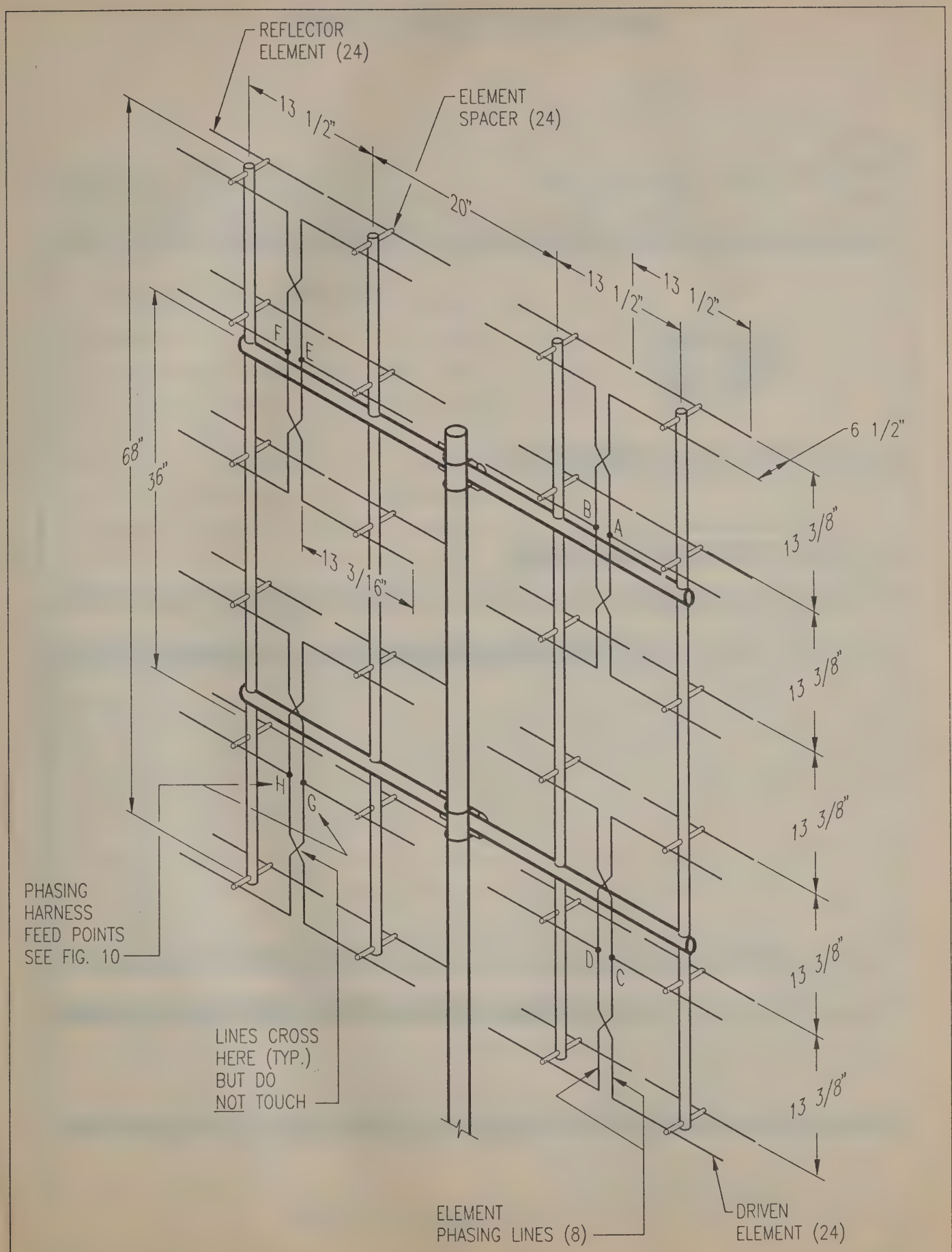
D = INSIDE DIAMETER OF OUTER CONDUCTOR $D = de^{Z_O/60}$

d = OUTSIDE DIAMETER OF INNER CONDUCTOR $d = \frac{D}{e^{Z_O/60}}$

$\ln X = e^x = 2.718^x$ where $x = \frac{D}{d}$

FOR Z_{IN} = 95 Ω and Z_{OUT} = 50 Ω
$Z_O = \sqrt{95 \times 50} = 68.92\ \Omega$
→ FOR Z_O = 68.92 Ω $\frac{D}{d}$ = 3.143"
FOR D = 0.402" d = 0.127 (USE 1/8")

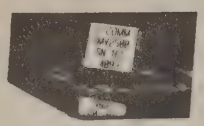
FOR Z_{IN} = 95 Ω and Z_{OUT} = 75 Ω
$Z_O = \sqrt{95 \times 75} = 84.41\ \Omega$
→ FOR Z_O = 84.41 Ω $\frac{D}{d}$ = 4.08"
FOR D = 0.402" d = 0.098"


REFLECTOR ELEMENT (24)
13 1/2"
ELEMENT SPACER (24)
20"
13 1/2"
13 1/2"
6 1/2"
68"
36"
F
E
B
A
13 3/16"
13 3/8"
13 3/8"
13 3/8"
13 3/8"
13 3/8"
13 3/8"
H
G
D
C
PHASING HARNESS FEED POINTS SEE FIG. 10
LINES CROSS HERE (TYP.) BUT DO NOT TOUCH
ELEMENT PHASING LINES (8)
DRIVEN ELEMENT (24)

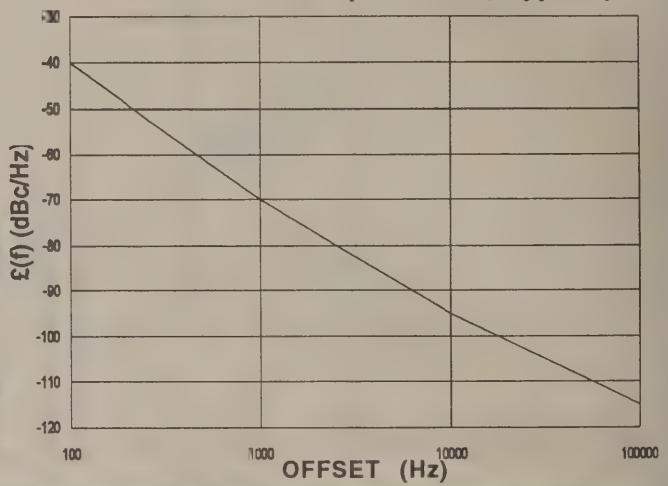
Z~Communications, Inc.
9939 Via Pasar • San Diego, California 92126
Phone (619) 621-2700 • Fax (619) 621-2722

SMV2500

VOLTAGE CONTROL OSCILLATOR



PHASE NOISE (1 Hz BW, typical)



FEATURES

- Sub-miniature size (0.3 in x 0.3 in x 0.117 in)
- 3 Volt Operation
- Tuning Range: 2400-2485 MHz

APPLICATIONS

- Wireless LANs
- Personal Communication Systems
- Portable Radios

PERFORMANCE SPECIFICATIONS	VALUE	UNITS
Oscillation Frequency Range	2400 - 2485	MHz
Phase Noise @ 10 kHz offset (1 Hz BW, min.)	- 85	dBc/Hz
Harmonic Suppression (2nd, min.)	- 20	dBc
Tuning Voltage	0 to 3	Vdc
Tuning Sensitivity (avg.)	65	MHz/V
Power Output	10 ± 1.5	dBm
Load Impedance	50	Ω
Input Capacitance (max.)	50	pF
Pushing	< 5	MHz/V
Pulling (12 dB Return Loss, Any Phase)	< 20	MHz
Operating Temperature Range	0 to 70	°C
Package Style	SUB	
POWER SUPPLY REQUIREMENTS		
Supply Voltage (Vcc, nom.)	3	Vdc
Supply Current (Icc, typ.)	16	mA

All specifications are typical unless otherwise noted and subject to change without notice.

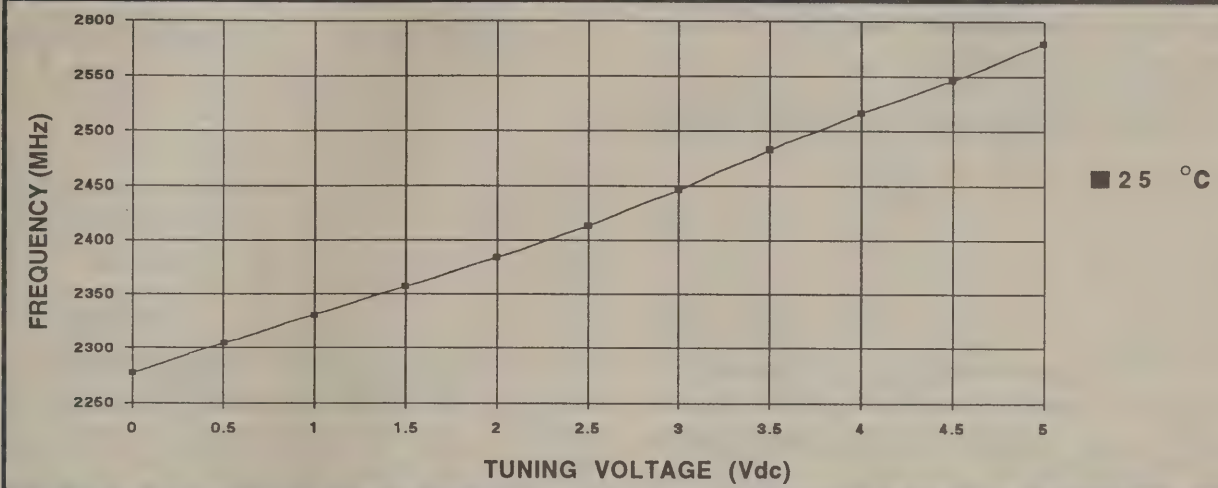
APPLICATION NOTES

- AN-101 : Mounting and Grounding of VCOs
- AN-102 : Proper Output Loading of VCOs
- AN-107 : How to Solder Z-COMM VCOs
- AN-108 : Proper Output Loading of the SMV2500 Voltage Controlled Oscillator

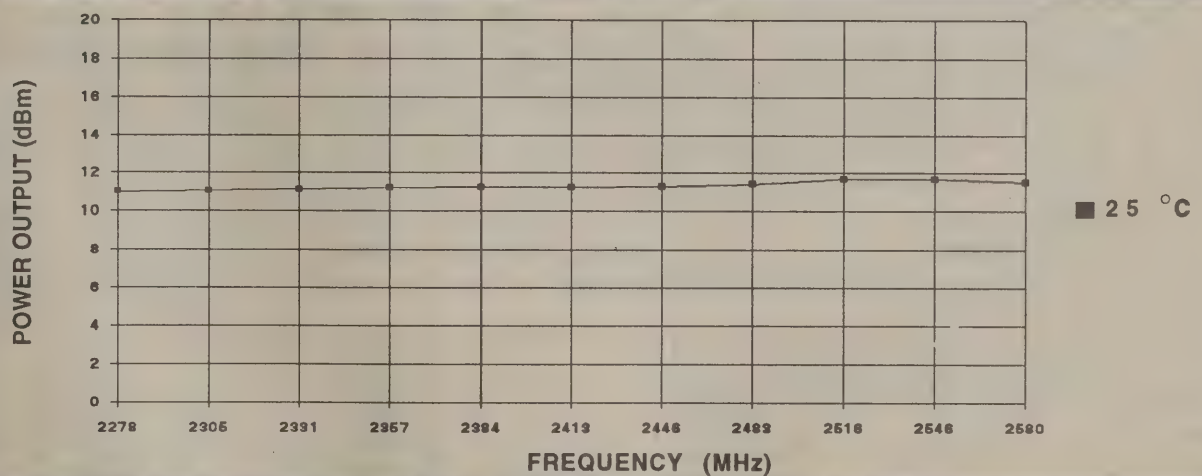
LOW COST - HIGH PERFORMANCE VOLTAGE CONTROLLED OSCILLATOR

SMV2500
PAGE 2

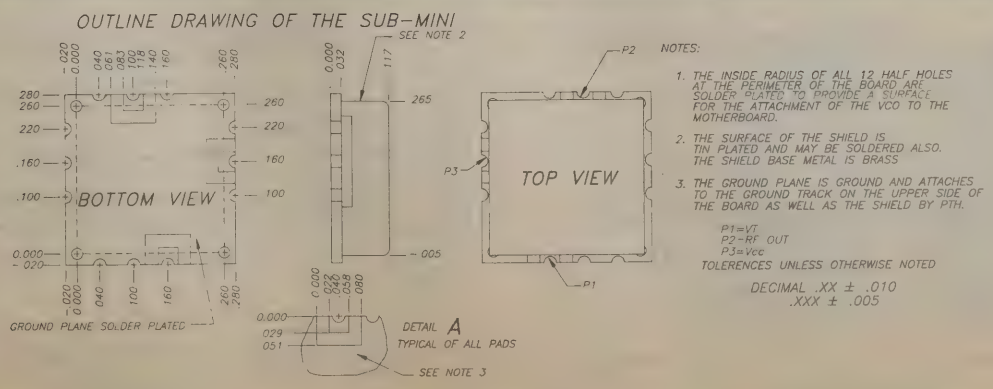
TUNING CURVE



POWER CURVE



PHYSICAL DIMENSIONS



NOTES:

1. THE INSIDE RADIUS OF ALL 12 HALF HOLES AT THE PERIMETER OF THE BOARD ARE SOLDER PLATED TO PROVIDE A SURFACE FOR THE ATTACHMENT OF THE VCO TO THE MOTHERBOARD.
2. THE SURFACE OF THE SHIELD IS TIN PLATED AND MAY BE SOLDERED ALSO. THE SHIELD BASE METAL IS BRASS
3. THE GROUND PLANE IS GROUND AND ATTACHES TO THE GROUND TRACK ON THE UPPER SIDE OF THE BOARD AS WELL AS THE SHIELD BY PTH.

P1=VT
P2=RF OUT
P3=Vcc

TOLERENCES UNLESS OTHERWISE NOTED

DECIMAL .XX ± .010
.XXX ± .005

The RF Line

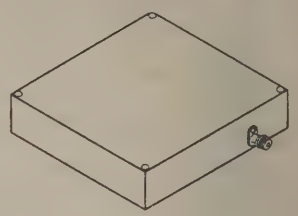
Broadband Linear Power Amplifier

ATV6060

60W, 470 MHz - 860 MHz
CLASS A
RF POWER AMPLIFIER

The ATV6060 is a solid state class A amplifier and is specifically designed for TV transposers and transmitters. This amplifier incorporates microstrip technology and reliable MOTOROLA push-pull transistors.

- Specified 25.5 Volts, 470 - 860 MHz Characteristics
 Output Power = 40 Watts @ –50 dB IMD (3 tones)
 Output Power = 60 Watts @ 1 dB Comp. (CW)
 Gain = 9 dB Min (Small Signal)
- Will Withstand Infinite Load VSWR
- High Performance, Gold Metallized Die for Ultra Reliable Performance



CASE 389U-01

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	26.5	Vdc
Storage Temperature Range	T_{stg}	–40 to +100	°C
Maximum Operating Temperature(1)	T_{op}	–20 to +70	°C

NOMINAL OPERATION CONDITION (T_C = 60°C)

Supply Current (V_{CC} = 25.5 V)	I_{sup}	9.2	A

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted, Z_{in}, Z_{out} = 50 Ω)

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain (Small Signal)	G_p	9	—	—	dB
Gain Ripple (Small Signal)	G_{rple}	—	—	±1.0	dB
Output Power @ 1 dB Compression	P_{1dB}	60	—	—	W
Load Mismatch (P_{out} = 60 W, V_{CC} = 25.5 V, f = 860 MHz, Load VSWR = ∞:1, all phase angles at frequency of test)	ψ	No degradation in output power before or after test			
Intermodulation (–8 dB/–7 dB/–16 dB, P_{ref} = 40 W)	IMD_1	—	—	–50	dB
Intermodulation (–8 dB/–10 dB/–16 dB, P_{ref} = 40 W)	IMD_2	—	—	–53	dB
Input Return Loss	IRL	—	—	–15	dB
Output Return Loss	ORL	—	—	–15	dB

(1) Temperature is measured at temperature test point (on the flange of the transistor).

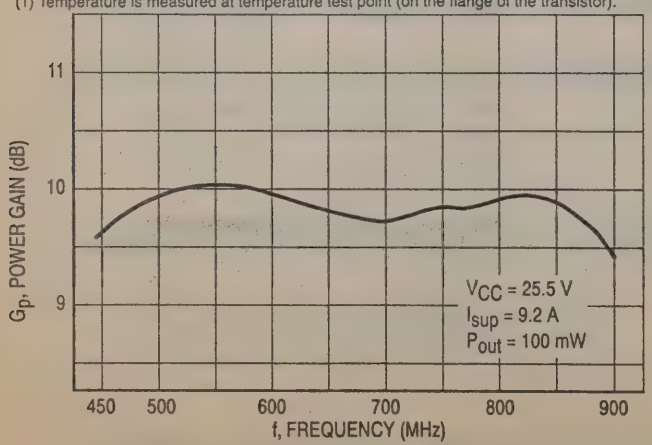


Figure 1. Power Gain versus Frequency

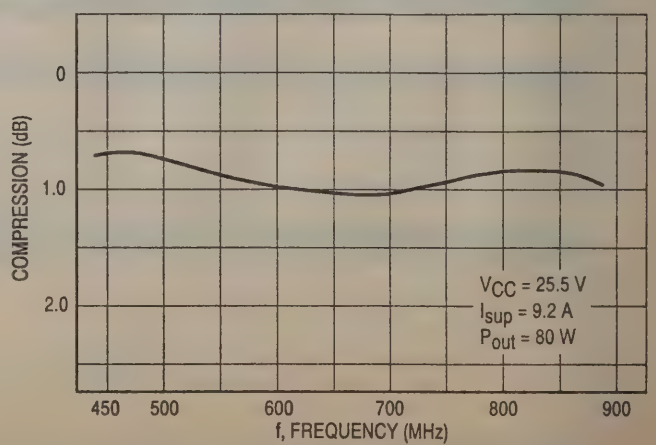


Figure 2. Gain Compression versus Frequency

KY ATV REPEATER

The ATV antenna is up on the 200 foot tower and the ATV repeater is working GREAT. K4VXP in Cambellsville gets into it like he was in town. Also Hank W4HTB in Bowlingreen is getting into it very good.

Put your TV set on CH. 57 and put an antenna in place of the cable and you should be able to see it.

HONESTLY HOOKED ON TV DXING

Back in the late 60's and early 70's, TV DXing was very challenging and demanding. I remember hours of lost sleep sitting on the living room floor three feet from my TV with Polaroid in hand till three a.m., waiting for the skip I've been working the last 25 minutes to flash their call letters. The half hour comes up and I've got five seconds and they fade for the next ten. When they come back, I can tell they're out of state so I make a pot of coffee and dig in for the next twenty five. I could snap a commercial spot but I want the CALL LETTERS. I know they're Florida from their ads. It's now time. My palms are sweaty. The commercial is over, the picture fades leaving only the clear sound which says: "This is WEAR TV 3 Pensacola Fla." I turn off the set in utter frustration only to find, now I can't sleep because I lost such an important fish. Little did I know tomorrow would bring a skip that would wrap XEFB TV 3 Monterrey Mexico around my antenna for over a week.

The only way to cheat at TV DXing was to go to the city of choice, snap all the call letters one can and mail out the reports from home. I'm sure the reward is not the same because I remember the fishing trip on Lake Michigan when I didn't catch a thing. One of the other members offered me one of his, and since I can't resist the taste of salmon, I accepted, but the pride of the catch was missing.

Today, even through propagation is down, it's so easy to cross the line. I feed my antenna system into my computer where I print pictures to the hard drive and later to my DX reports. Berta, my lovely wife, asks why don't you install a multiple event VCR and more antennas pointed in different directions and program the VCR to turn o at the hour and half hour throughout the night?" "You're sure to get more QSLs that way." All I could say was: "They wouldn't be my fish, the pride of the catch would be missing." Michael J. Condon Quest SWL -- QA9A

60 WATTS ON 400-900

Motorola has made power easy easy with various "brick" devices, such as the MHW 710, widely used on 440 MHz ATV and similar devices for 900 MHz. The newest device is even simpler, being equipped with N type input/output connectors! No PCB construction needed. Apply power and drive and antenna and bingo, instant power boost. Yes, yu can use a combiner and have even more. Commercially up to 8 units are used as a driver for high power amplifiers, they would provide about 400 watts (there are losses in combiners) output with a very clean signal (broadcast specs), albiet an expensive 400 watts. All the specs are here from the Motorola information sheet to use one for 400 or 900 MHz ATV operation.

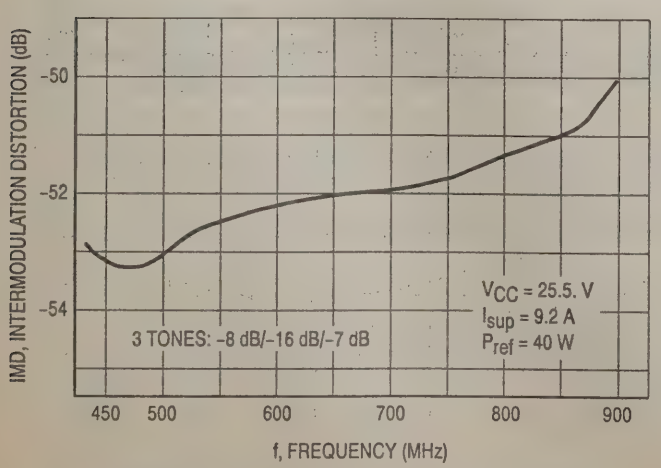


Figure 3. Intermodulation versus Frequency

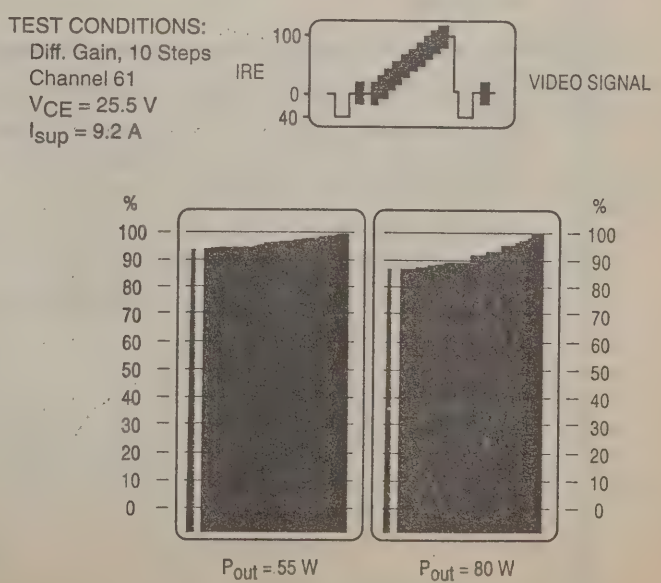


Figure 4. Gain versus Output Power

Harlan Technologies
5931 Alma Dr.
Rockford, Illinois 61108

! PRESS RELEASE !

Harlan Technologies announced **COLOR Slow Scan TV for the Sound Blaster** sound card at the 1994 **Dayton Hamvention**. The new version is an upgrade from Slow Scan II which would copy color modes, but display them in black and white. COLOR Slow Scan will **SEND** and **RECEIVE** Robot 8, 12, 24, 36 second black and white, Robot 36 and 72 second color (displaying in COLOR), as well as Scotty 1 and Scotty 2 (displaying in COLOR).

Hookup of the Sound Blaster compatible card to your radio equipment is very easy. The sound from the receiver is connected to the microphone input of the sound card, and for transmit, one channel of the stereo output from the card is connected to the microphone input of the transmitter.

The **SEND** mode is accomplished by reading the pixels on the screen and creating a voice file (.VOC), which can then be transmitted. Appropriate SYNC is added for the mode being used.

A larger display area, plus a **ZOOM** to full screen feature was added.

COLOR Slow Scan will **AUTO TRACK** +/- 150 Hz for the best color pictures! After the picture has displayed, the amount of frequency difference detected is displayed.

Horizontal resolution has been doubled giving a much **SHARPER PICTURE**.

Pictures can be **SAVED** in **.PCX** format so they can be re-displayed and used in paint brush programs. A **SLIDE SHOW** feature was added which will continually show .PCX files saved.

Requirements for COLOR Slow Scan are a PC computer (286 or better) with DOS 3.3 or higher & 640K memory, hard drive, VGA display capable of 640x480 - 256 colors, and a Sound Blaster compatible card such as Sound Blaster, SB PRO, SB16, Thunder, PAS16, or Fusion.

COLOR Slow Scan can be ordered from **Harlan Technologies, 5931 Alma Dr., Rockford Illinois 61108 (815) 398-2683** for **$99.95** plus $5.00 shipping (overseas shipping $10.00). Illinois residents add $6.25 tax.

FCC LICENSE FEES UP TO $18,000 PER YEAR!

The FCC new license fee schedule has been published. The rates vary from service to service, from a low of $7 per year for aviation and marine stations ($35 per five year license term) to $18,000 per year for a top 10 market VHF TV station ("only" $14,400 for a top 10 UHF TV station. These "fees" are simply taxes with a new name.

Interactive video services (much ballyhooed in the media of late) will be $80 per five year license. General mobile radio service (GMRS) at $35 per year as well as other land mobile services. Commercial radio operators (those First, Second and General class Radiotelephone certificates) $35 for five years and holders of the lifetime restricted operator permit, a one time $105 fee. Currently there is a $35 fee for the ROP.

Amateur Vanity Call signs, will be $70 for a ten year term. Amateur are otherwise specifically exempt from the statute.

AM, FM and TV Broadcast stations will pay from $900 to $18,000 per year depending on market size and facilities. Even construction permits will be assessed an annual fee. Low power TV stations will also be assessed a fee of $135 per year.

Cable TV systems will pay $370 per 1,000 subscribers per system. So expect your cable TV rates to go up. If you have a satellite TV station, the fee is $65,000 per year, the highest of all fees except for low orbit stations at $90,000 per year. Earth stations, receivers of satellite TV will pay $6 per year except for antennas over 9 meters who will pay $55 per meter per year.

Expect your phone bill to go up too. Telephone companies will pay up to $6,000,000 per year AT & T, $1,210,000 for MCI, $531,000 for Sprint, and $509 for others. Local telcos will also pay up to $60 per 1,000 subscribers. The FCC has established a cutoff of $417,.000 for the top 20 exchanges (telephone operating companies). Bell Atlantic, Bell South and Ameritech are all over $1,000,000. The next five range from .5 to .9 Million, with over $8.377 million in fees per year being added to the top 20 phone company bills. Watch the tax hike on your phone bill later this year. It may actually be cheaper for all us hams to use the Phone patch than have a home phone! Ref FCC rules 73-1600-1613.

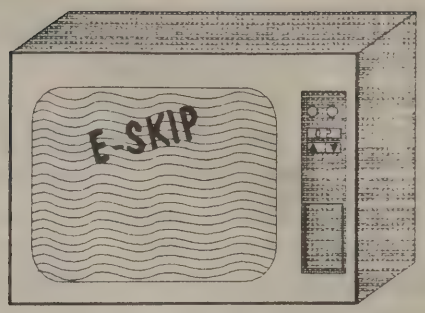
And you believed them when they said:
NO NEW TAXES ON THE MIDDLE CLASS!
HAR HAR HAR.

FOR SALE

Clearing shack of excess equipment.

- AEA fstv-70 ATV transceiver with 421.25 and 439.25 xtals, like new, used for demo only, and
- RLA-70 mast mount amplifier, .4 to 1 watt in, 50 watts out (measures 60 watts on PEP watt meter) with receive preamp and AEA matching dual power supply (12 volts for rig, 26 volts for amp). All in perfect condition. Over $700 retail. First offer over $500 takes all. (plus shipping)
- WYMAN Research 440 MHZ FM (rated 15 watts) and AM (rated 8 watts PEP) ATV Transmitter. As new, (over $400 retail) never used. $300
- Microtech micro TV tx (434 MHz) and audio subcarrier board. $190 retail, $130 for both.
- PC Electronics 900 MHz transmitter and matching receiver. Like new. $ 300 for both.
- 900 Mhz loop yagi, Downeast Microwave, assembeled, never used. $100 pick-up only.
- PC Electronics 1200 MHz transmitter and matching receiver. Like new $350 for both.
- KLM 4 antenna stakcing kit for 440 MHz. New in box. $75. (plus shipping)
- Micro-Video camera, mounted, never used. Retail $229.95. your for only $175.00.
- Microvideo camera, with Microtech transmitter (434 MHz) ready for use on 9 volt battery (as seen at many ATV demos) Retail over $360, perfect for R/C yours for only $275.00
- Hustler G7-220, 7 dB 220 MHz vertical. One year old. $100 pick-up only.
- Henry KB9FO c/o ATVQ.

Welcome to the world of
E-Skip !



Each summer, and during the middle of December, the sun often energizes a layer of the atmosphere called the E-Layer. When this occurs, television signals on channels 2 through 6 will reflect off the E-Layer and travel for distances of approximately 500 to 1800 miles away. Think of the layer as a field of broken pieces of mirror floating in space. Although the signals travel great distances, they are often received with distortions creating blurry or ghost-ridden pictures. This set of logo maps hopefully will make identifying these stations easier. They are presented free of charge as a joint venture of Monitoring Times magazine and The Worldwide TV-FM DX Association to promote the hobby of TV DXing.

Our sincere thanks to all who mailed in logos for this project. Please bear in mind that this is the first edition of these maps, and errors may occur. Station call letters and logos change constantly. YOU are the experts!

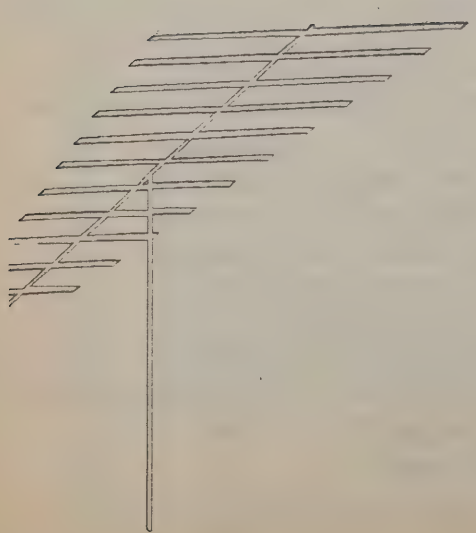
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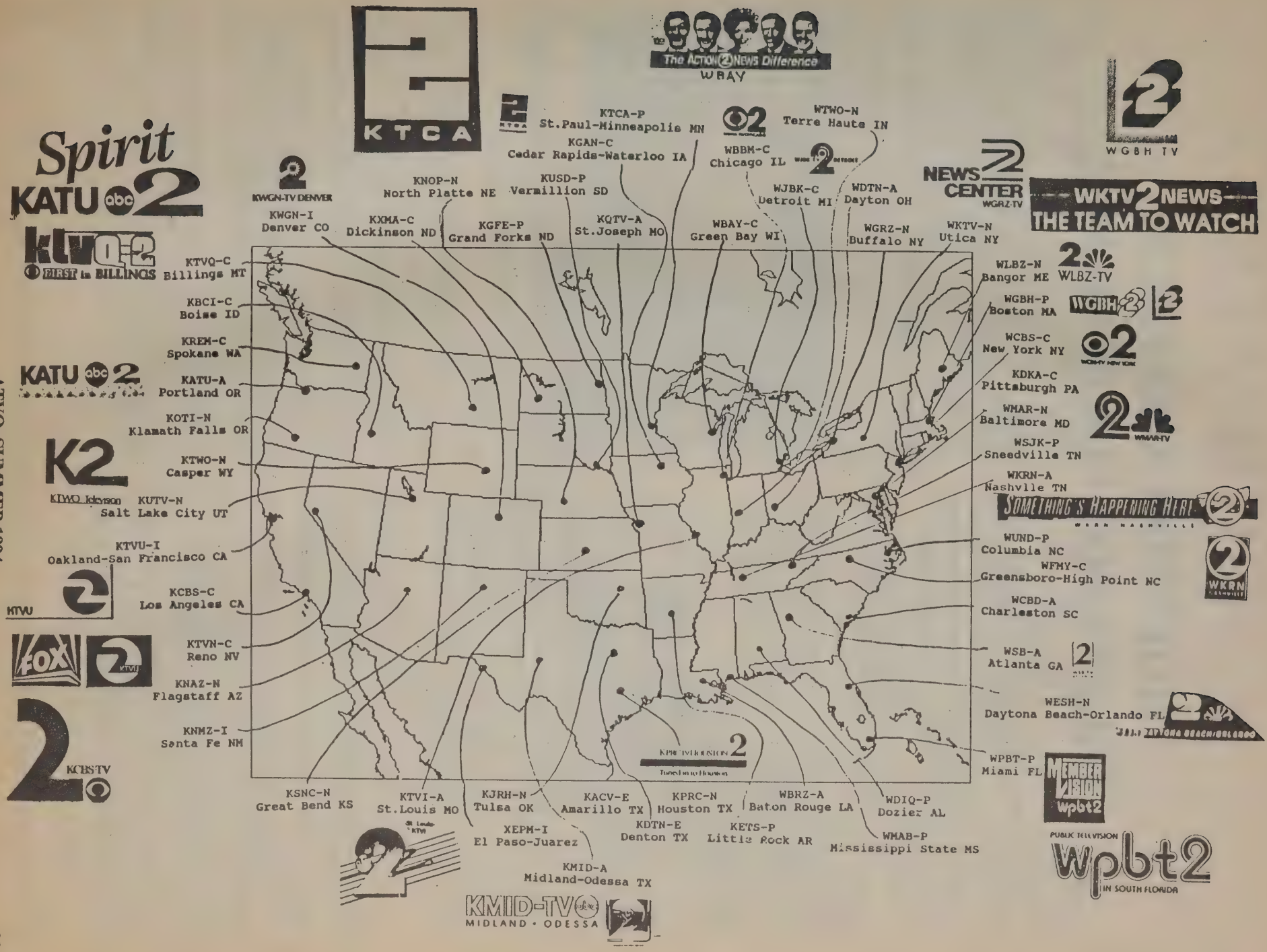
and we will include them in our next edition.

For more information about this hobby, send a self-addressed stamped envelope to:

The Worldwide TV-FM DX Association,
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HOUSTON AMATEUR TELEVISION SOCIETY, INC.

The main topic of discussion was the upcoming Tenneco Marathon on Jan. 16. We discussed the location of transmitters, how the net control (Ed) would request members to transmit and other logistics. This was a very good meeting and a step toward our first public service project (see below).

We also discussed the possibility of moving the 440 ATV Xmitter and Rcvr to the Clear Lake area to allow more users access to a local repeater. We solicited clubs in the area for support in finding a location and managing the repeater. This repeater will need a power supply and Video ID board as well as a few other odds and ends to be operational. This move would put 3 separate 440 ATV Repeaters in operation in the Houston area!

HATS First SERVICE Project

The Houston Amateur Television Society, Inc. performed video coverage of the Tenneco Marathon on January 16, 1994. The approximately 12 volunteers arrived at the central merging center at 6:30 to receive their car passes and the ID badges then raced to their locations on the course. After a quick setup, most stations were testing and transmitting. Picture quality through the PZP repeater ranged from P3-P5. Reception of the 1.2 Ghz link was P5 throughout the entire race. I think everyone involved in the race learned a lot about antennas, feed line, etc. Some stations were using verticals, some beams. The most successful stations were using beams and amplifiers.

The main concept of providing video coverage was overwhelmingly received at the George R. Brown Convention Center as judges and VIP onlookers asked several questions about the club and were very impressed that the picture was coming from amateurs and not professional video engineers.

Please take time to personally thank the persons who represented HATS at this special event!

The stations participating were: Ed Manuel, N5EM and Carl Kotilla, WD5JRD, at the command station. Jeff Johnson, KCAWJ, and Charlie Keng, N5XGW, at the 1.2 Ghz Xmitter. Remote teams on 440 Mhz through the PZP repeater were Steve Leeson, N5ENC, Fred Juch, N5JXO, Bill Potter, N5MBM, Walter Holmes, WD5GAZ, Teresa Holmes, KB5VUD, Mike Frank, N5OZ, Laurel Frank, KB5WWF, and Keith Lingwall, KB5NSD. Several people monitored the activities on the PZP repeater during the event.

The main topic of discussion was the move of the 440 ATV Xmitter & Rcvr to the Clear Lake area to allow more users access to a local repeater. The Johnson Space center club along with two other local clubs have agreed to sponsor the ATV repeater in the Clear Lake area. The siteis expected to be on a 100 foot tower. That's pretty good considering the totally flat terrain. HATS will try to link all three Houston ATV Repeaters in the near future as funds allow. We will probably use 2.4 Ghz and up as linking frequencies.

ATV Talk Repeater!

There is a new repeater in the Houston area that is dedicated to ATV conversations. The 146.92 repeater (input -) has been moved and has the same general coverage as the PZP repeater. This repeater currently needs a 103.5 sub audible tone on your radio signal to operate but we will work on getting that changed if possible (removed). The priority on this repeater is 1-
Emergency Traffic, 2-ATV talkback and communications, 3-general rag chew.

Please use and appreciate this repeater.

On-Air ATV

The Experimental ATV flight performed by the Austin Emergency communications group was very interesting to watch. On February 27th an airplane transmitting ATV on 426.26 flew from Austin to southwest Houston while transmitting ATV pictures of the surrounding scenery. The view when the amp was on was great P5. Unfortunately, the amp caused interference with the handheld GPS receiver, so it was rarely used. Pictures were generally P4. The cross band repeater allowed Hams in Houston to talk into Austin, and vice versa. The cross plane link never materialized but the event was fun anyway.

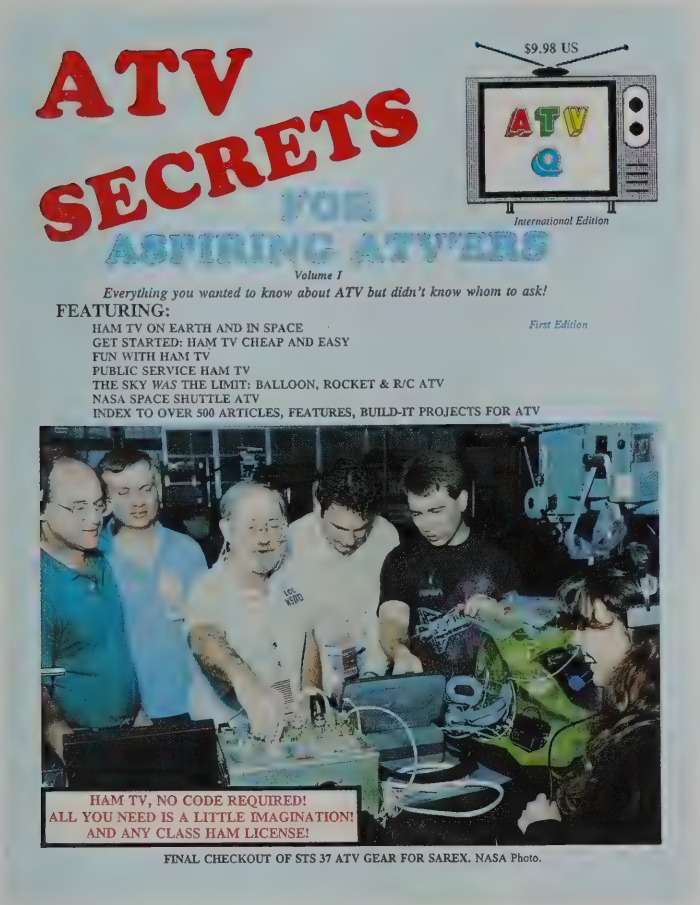
The March of Dimes video tape was great! We had a lot of fun watching the composite tape at the last meeting. And as usual, the 1.2 Ghz pictures were flawless with interference on the 440 Band.

ATV BOOKS

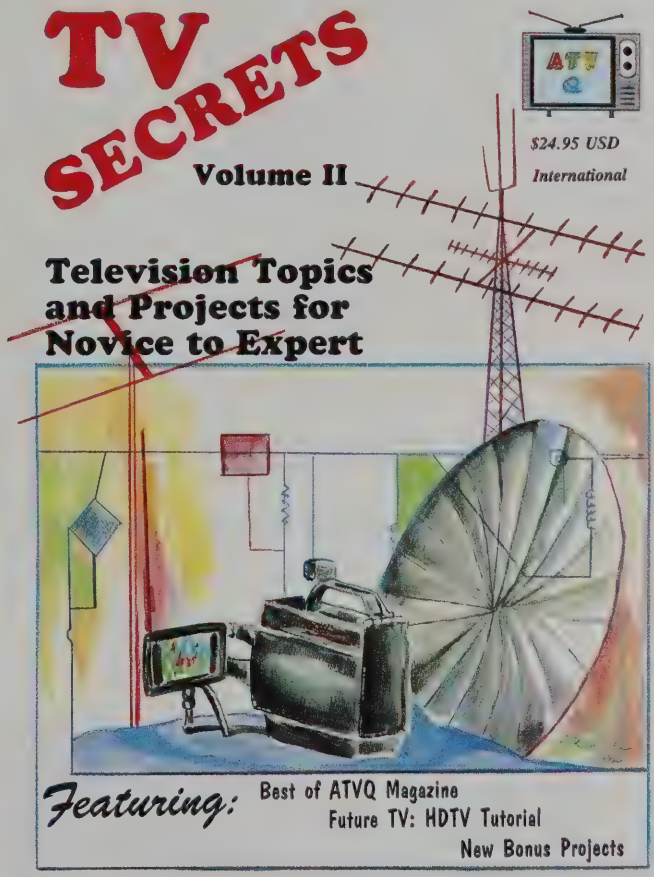
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FINAL CHECKOUT OF STS 37 ATV GEAR FOR SAREX. NASA Photo.



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volume two,

for advanced ATV'ers,

As published in the October 1992 issue of QST.

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ATV BOOKS

From the BATC available through ATVQ

ATV COMPENDIUM

104 pgs. 8.25 x 5.75 1989

A collection of projects and useful topics from issues of CQ-TV, compiled by Mike Wooding G6IQM. A high quality work with projects that work in both NTSC and PAL video systems. The BATC offers circuit boards and kits for most items they publish at reasonable cost. This book is OUT OF PRINT. A limited quantity of copies are on hand.

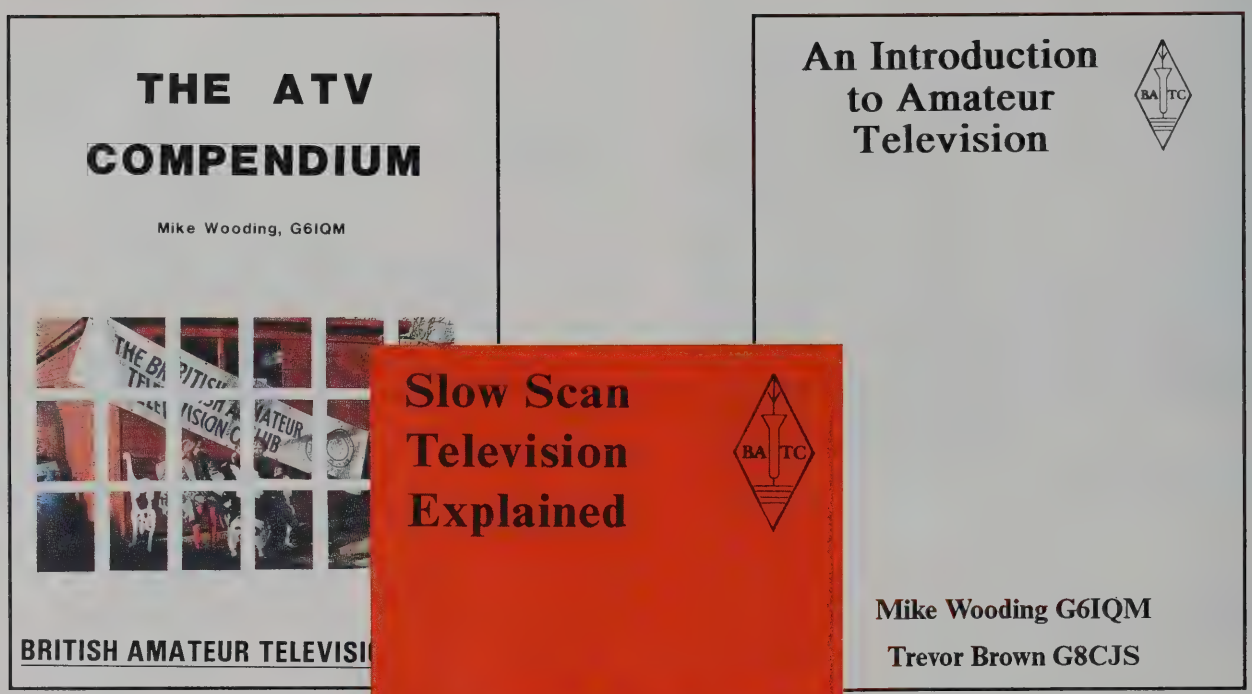
Available from ATVQ at $14.95 POST PAID.

AN INTRODUCTION TO AMATEUR TELEVISION

154 pgs. 8.25 x 5.75 1992

A collection of projects and useful topics including 24 cm ATV and a modular remote control station. Written and compiled by Trevor Brown G8CJS and Mike Wooding G6IQM. A high quality work. Circuit board layouts are provided and most projects are available as circuit boards or kits from the BATC at reasonable cost.

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FROM THE EDGE OF SPACE TO YOUR HAM SHACK. . .

"On October 23-24, 1993, the Mount Diablo Radio Club hosted PACIFICON '93 here in Concord, CA.

One of the highlights of the convention was the launching of two balloon flights to over 100,000 feet containing amateur radio equipment and a television transmitter and camera to send back pictures from the edge of space.

We obtained one of your 9127C color cameras for the balloon package, and flew the camera on two flights during the weekend. On the first flight, the package rose to about 100,000 feet before balloon burst and a free fall parachute descent back to earth. The camera and package survived the trip with no damage, and was reused on Sunday for the second flight to over 110,000 feet before balloon burst. During the descents, we watched color pictures of the earth below, and determined landmarks which assisted the chase teams in locating the landing areas.

I am now using the well traveled camera in my home ATV station as a studio camera, freeing up my camcorder for other uses.

My compliments on the resolution and color performance of this camera! I am very pleased with it, and do not hesitate in recommending it to my fellow hams."
-- Don Smith, W6NKF
Balloon Launch Committee Chairman

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FIRST EVER HAWAII to CALIFORNIA ATV WORLD RECORD DISTANCE: 2518 MILES on 434 MHz. FULL COLOR RECEPTION IN CA

The Summer tropo duct between Hawaii and mainland USA opened strong enough on July 11th for the first fast scan ATV contact over this 2500 + mile path.

Paul Leib KH6HME, long known for his VHF-UHF DX from Hawaii to USA, Japan, New Zealand and elsewhere, had to wait nearly two years after ATV equipment was hand carried to his Moana Loa Volcano hamshack by Tom O'Hara W6ORG, and Gordon West WB6NOA. Gordon and Paul had been trying for two years, but band conditions were not cooperative for the normal summer tropo conditions until this month.

Paul's 432.0 CW beacon on horizontal beams was heard in the Los Angeles area, triggering locals DX alarms. Several coastal hams have systems which monitor the frequency and alert the station owner when a signal is detected. Paul rotated the phase for vertical polarization for ATV since California uses vertical for ATV. Paul station consists of a 10 watt PC Electronics transmitter and a Mirage D1010NR-ATV amplifier.

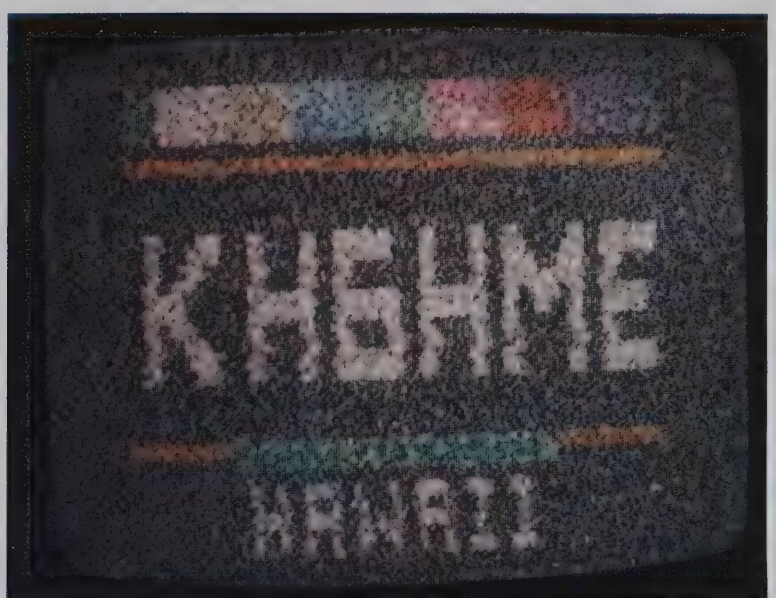
Early in the afternoon Paul and Gordon were rewarded by a strong tropo opening. Early signals were P2-P3, and Gordon called Tom to alert other Southern California ATV'ers to the band opening to Hawaii. As the afternoon went on, the signals got better. Pictures provided by Gordon West WB6NOA, printed here, show strong video with color.

Gordon is about 2508 miles from KH6HME. Gordon's world record ATV DX contact was soon shattered when Mike Henkoski KC6CCC in San Clemente, CA at 2518 miles also received the KH6HME signal. Mike also supplied ATVQ with a photo of his reception, which was in black and white. Mike was able to video tape his reception using a High-8 camera and ATVQ has a 5 minute copy on VHS with live audio as Mike describes the contact to Tom W6ORG. The Elktronics video ID graphics are clearly visible, and Mike's video captured all four screens. Mike KC6CCC is the owner of Microtech video, manufacturer of micro ATV transmitters suitable for R/C use, and Gordon West operates the Gordon West ham radio school. Both are active and avid hams, Gordon also known for his many columns and articles in various magazines including Maritime mobile operation.

The opening lasted about 4 hours with Paul transmitting 15 minutes on the hour and half hour. A return signal was not accomplished because Paul did not have a TV set in his mountain side QTH! A set was to be taken the next day.

Voice coordination between Hawaii and California was on 144.170 SSB. This same opening was in later days able to produce a new record 2304 MHz contact and efforts were made for 10 GHz contacts which were not successful.

FIRST EVER HAWAII to CALIFORNIA ATV WORLD RECORD DISTANCE: 2518 MILES on 434 MHz. FULL COLOR RECEPTION IN CA





The w6ORGy Notes

By Tom O'Hara, W6ORG

IF IT'S APRIL, IT MUST BE DAYTON REVISITED

Wow what a crowd inside - one could hardly move at times. The weather made a swamp out of the flea market and everybody stayed inside to keep out of the rain. While I feel for those looking to sell and trade gear in the flea market, it really helped those of us inside. We sold out of Transceivers and of a number of items by Saturday afternoon. Post Dayton sales have also been good.

So while costs are still too high, and the weather wiping out the flea market for all three days of unusually more than normal traffic past the booth, I can't say conclusively yet whether it makes business sense to go again - so we will be there next year and re-evaluate.

SHORT DOWNEAST

I bought a new Downeast Microwave 1200 MHz antenna mounted preamp to receive two of the local ATV repeater outputs and got all kinds of broadcast intermod and complete wipeout whenever I talked back on 2 meters.

After taking it back down off the antenna, I put it on the bench and checked it for oscillations, gain and bandwidth. I found no oscillations with all different VSWR's applied and the gain was as advertised. It is not unusual to tune up a preamp with a good 50 ohm generator only to find it's an oscillator when connected to the antenna. The antenna may have a low VSWR in the designed band but who knows what it looks like and presents to the preamp at all frequencies out side the band. It can easily take off and oscillate at any frequency depending on the reflected resistance and reactance presented by the antenna outside the band and become an unwanted downconverter.

The big surprise however was the bandwidth. Bill Olson doesn't need to sell different preamps for different bands, just this one which covers almost DC to light. At 1200 it had the advertised >20 dB gain, but at 146 MHz, it had 16 dB gain! So it was no wonder that strong broadcast TV signals and my 2 meter transmitter swamped and overloaded the downconverter. There are no tuned circuits in the preamp.

So what to do? It was as simple as putting a 1/3 of an inch long piece of #22 buss wire "two meter short" from the preamp antenna input to ground. This wire is enough of an inductor or RF choke at 1200 MHz to have little effect on ATV at 23cm, but dumps the two meters to around -10 dB gain. The gain at 434 MHz was -2 dB which kept my ATV transmitter from desensing the repeater receiver which allows me to see my own video coming back. However gain at 900 MHz was +17 dB.

I talked to Bill Olson at Downeast Microwave and he made his own tests with the "two meter short" and found that it only caused the gain to decrease by 1/2 dB and also the noise figure went from .7 dB to 1.2 dB which is hardly noticeable in the picture.

For those who might also use the preamp for CW or SSB weak signal work and want the last little bit of system noise figure, you could experiment with a lower loss "short" - longer copper strap selected for resonance at 1200 MHz.

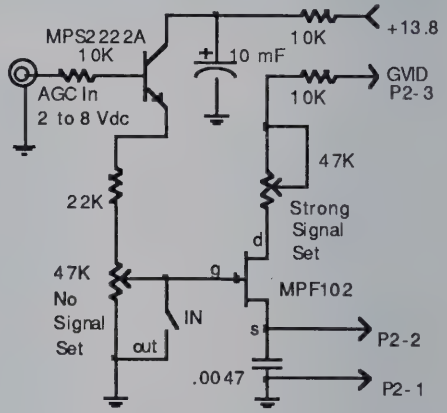
So some of that noise or occasional strange interference you see in the video may actually be front end overload and intermoding at the following preamp or mixer stages. The short is simple and easy compared to adding an external low loss bandpass filter. Check your 440 or 910 MHz preamp and see if there are any tuned circuits. If there aren't any, play with an inductor to ground right at the antenna input and see if it helps. This "short" will also help in bleeding off any static build-up from the antenna.

VIDEO S-METER

Wouldn't it be nice to have a signal strength indicator on the repeater output so users could more accurately rotate the antenna or see the difference an amp, better coax or antenna might have or who is strongest?

Well there might be a way with a few parts added to the High Technology Flight GVID video ID overlay board to do just that. Or you can connect to any source that is voltage variable between 2 and 8 Vdc and overlay it as a white line at the top of the screen of varying length .

The GVID will only work with P4+ video. So it can either be connected to the RF front end AGC and overlaid on the received video, or switched in via tone control to overlay on the regular repeater video IDer like an Elktronics board, etc., and connected to the IF AGC for indicating P0 to P5 signal strengths. A relay in place of the in/out switch can remotely turn it on and off.



The parts are all available from Radio Shack. If used at a repeater, they should be in the same shielded enclosure with the GVID board. Use .001 mF feed through caps, or coaxial connectors each bypassed with 220 pF caps with short leads if you make any connections between enclosures to keep transmitter RF from using the leads as an antenna to conduct into the receiver. All external wires in a repeater system should be tight braid coax.

In the ATVR receivers using the VRC45a or b IF's, the IF AGC S-meter output has between 6 and 7 volts with no signal, and goes down to about 4 volts at P5. The RF AGC goes from 7.5 Vdc for less than P5 down to 2.5 Vdc saturated. Which ever you select to be indicated, first set the no signal 47K pot to where it is just visible for about 10% on the left side of the screen. Then set the strongest signal pot for about 90% of the way across.

You can get another EEprom blown with P units or relative numbers for easier reference if you like.

73, Tom O'Hara, W6ORG

ATV MAGAZINES

CQ-TV

A quality quarterly publication covering mostly British ATV activity, club news and usually several good technical projects per issue. Typically 100+ 5.75 x 8.25 pages per issue. Most projects will also work or can be adapted to NTSC standards from PAL.

Covers video, ATV, SSTV, ATV repeaters with construction projects. Most projects also have circuit boards and kits available at reasonable cost from the BATC.

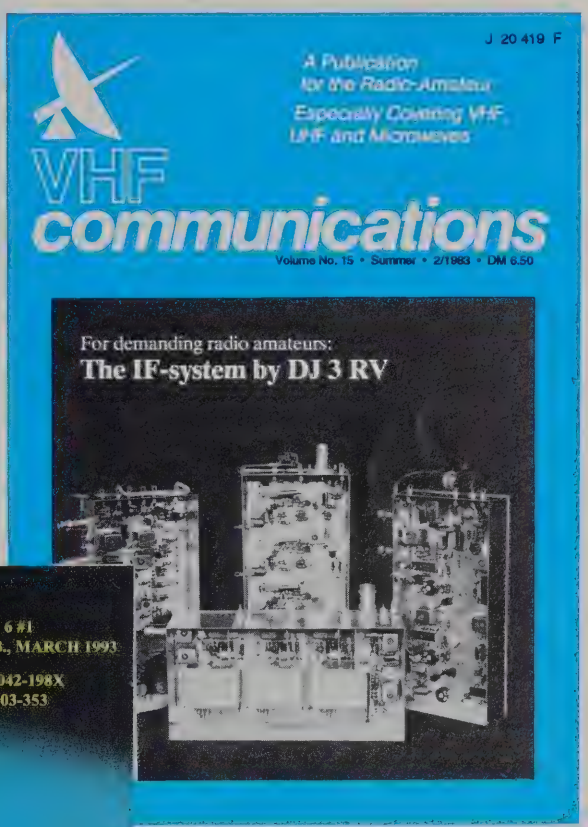
USA residents may subscribe via ATVQ for $21/yr which includes all foreign funds exchange fees.



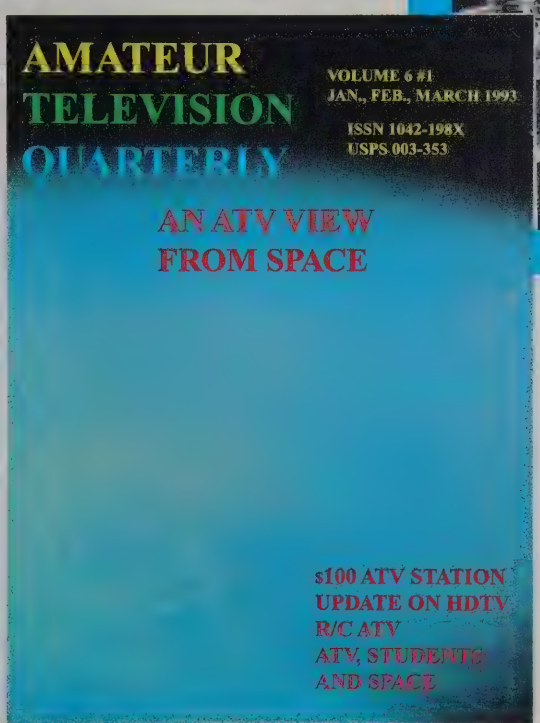
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Published four times per year. a must read for any video hobbist. Just the facts without hype. $18/yr US, $22 Canada, $29 DX. multi-year discounts, see order page. ATVQ sponsors the annual friday night Dayton ATV Party featuring expert speakers, live demos, socializing and ATV fun. Published by Henry KB9FO and Bill WB8ELK.



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CLUB NEWS & HAMFESTS

F.A.R.E., the Family Amateur Radio Event holds its second annual event on Saturday, September 17, 1994, at Rawhide Western Town, 23023 N Scottsdale Road, Scottsdale, Arizona. Last year's F.A.R.E. drew a crowd of close to 3,000 people, many newcomers to the exciting hobby of amateur radio. Returning this year will be a visit by Ronald McDonald for the kids and young at heart. There will be face painting, coloring contests, and a bird show for the kids. Also, a radio controlled airplane demonstration is also planned. Forums will be presented on weather satellites, how to set up a satellite station by AMSAT, using a ham radio in an emergency, and more! This year, all exhibits will be hands on for all in attendance to use...solder PL259's, learn to send cw on a straight key, make packet and Amtor contacts, see yourself and utilize amateur television, hit a repeater and make an autopatch, send traffic via MARS or NTS, talk to others around the world via HF rigs! All this plus the Salvation Army Emergency Radio Network, the National Weather Service, the American Red Cross Disaster Services, and **13 local clubs** and organizations exhibiting.

Add to this door prizes given away at least every 15 minutes, and great big raffle prizes too. Breakfast and a full lunch available. **PLUS a HUGE swap meet area** which opens at 6:00 a.m. The exhibit hall opens at 9:00 a.m.

For more information, or to be an exhibitor, please contact Len Winkler, KB7LPW, at 602-861-0303, or PO Box 9219, Phoenix, AZ 85068. Thank you very much. Len Winkler, F.A.R.E. Chairman.

UNION COUNTY, OHIO

The Union County ARC proudly announces their 18th annual Marysville HamFest and Computer Show to be held at the Fairground in Marysville, OH on Sunday, August 21st. The gates will open at midnight for vender setups and to the public at 6:00 a.m. Sorry, no overnight camping this year. Plenty of indoor and outdoor spaces. Tables indoors with electric hook up are $15.00. Outside 10x10 foot spaces are $5.00 each. Tickets are $4.00 advance or $5.00 at the gate. Everyone needs a ticket. Free parking. 30 to 40 hot air balloons will launch from the grounds on Saturday night and Sunday morning. Be sure to bring your camera for some great photos.

Huge flea market, rides, food vendors, craft shows, door prizes and much more this year. This is the big onein central Ohio you want to attend. More information or tickets, contact Gene Kirby, W8BJN, 13613 US 36, Marysville, OH 43040, 513-644-0468 evenings.

THE INDIANA AMATEUR TELEVISION AND UHF CLUB NEWSLETTER

The Dayton Hamvention has come and gone. In many ways it was the best ever. The rains drove the crowds indoors and business was brisk inside the main buildings. Both SSTV and ATV forums were very well attended. The Friday night get-togethers of SSTV and ATV at the Holiday Inn North had standing room only at times. The announced attendance was 33,600 people. Tickets went as high as 39,000.

Our early morning ATV net at 6:30 a.m. is getting larger all the time. We now have two well known hams operating and calling in from Bloomington, IN. One is Bob Meyers, K9KTH, one of the former club presidents, and the other is Stu, W9HRZ. Dewey, WD9DKO is also calling in from Bedford, IN. Pictures are usually P1 to P5. DXing on ATV is great fun. You never know what to expect each morning as the sun breaks the horizon. You can expect to work from 5 to 8 ATV stations most mornings.

Malcolm and Paul have been testing some 1200 Mhz gear from a helicopter operating above the city. It appears to work well. There were some minor difficulties with power supplies on the helicopter that damaged the output power brick. Even with just a few milliwatts of feedthrough power, the pictures were reasonably good.

I get lots of calls concerning how to build a repeater. I usually recommend a crossband repeater because of the simplicity. The only crossband repeater close by is the one at Ft. Wayne. Jim Pliett, K9OMA, was the power behind its construction. It has an input frequency of 439.25 Mhz and an output in the 900 Mhz band. It is amplitude modulated both on input and output. I think that the reason that they used this mode was to take advantage of the Rabbit baby watcher units that are available at a very low price. de W9NTP

Arizona Amateurs on TV, Michael J. Baker KQZ/7, 6451 W Bell Road #2039, Glendale, AZ 85308, 602-878-3544

NTIA, Mr. Norbert Shroeder
Program Manager Spectrum Operations
Dear Mr. Shroeder:

On behalf of the Membership of the Arizona Amateurs on TV and all Amateur Radio Operators, we officially protest the further break up and reallocation of the 13cm Amateur Band. To further segment and destroy the cohesiveness and overall size of this, our lowest frequency microwave band allocation, would seriously impact the current and future use of this very valuable radio spectrum.

To support this opinion, let me further explain the why and how we Amateur Radio Operators will be impacted by your proposal.

Of all of our UHF and Microwave frequency allocations, the 13cm band is the lowest frequency band that permits us to operate wide band modes such as Frequency Modulated Television and High Speed Digital Communications. The single greatest impact on our Radio Club would be the elimination of the use of Wide Band Frequency Modulated Television as both link service between remotely accessed TV repeaters, and as a primary repeaters located within a large metropolitan area (like Phoenix and Tucson).

Within the last 5 months, our club has undergone the largest single period of expansion in the 12 year history of the club itself. We have finally gotten a group of hams in the Tucson area that are sincerely interested in erecting a TV repeater in their area and want to do so with the handshake cooperation of our club. These two repeaters would be linked via a 2400 Mhz wide-
band FM TV link. On both ends of this linked repeater system there would be an AM TV output on 2400 Mhz, with an auxiliary input on 1.2 Ghz AM TV, as well as cross tied operation to the current 434.00/421.25 VSBTV repeater and, the newest addition to our system, a 1265 Mhz/916.37 WBFMTV repeater.

If you take a look at all of the frequency allocations that we Amateur Radio Operators have available to us, it becomes painfully obvious that the only functional, inexpensive, and lowestfrequency band that permits both input and output of wide band emissions within the same band allocation, is 13cm.

There are other, perhaps less obvious reasons for not taking away this portion of the radio spectrum. I'll give you a few of my observations that appear to be relevant to the proposed changes.

As an Extra Class Amateur for the past 18 years and a licensed Radio Amateur for 26 years, I have been directly or indirectly involved with almost every facet of the hobby. DXing, VHF, UHF, Packet, RTTY, AMTOR, etc. you name it and I have been involved at one time or another.

Five years ago I met a bunch of guys who were playing with Amateur Television and found their operation interesting but not necessarily what I was most interested in at the time. I went out with the demonstration crew to put on a demo for one of the high schools and was surprised to find that one of the club members was retransmitting the Space Shuttle Video via an amateur repeater. Not only were the kids jazzed by that demo, but so was I. How wonderful that we could perform this service and provide the spark to get young people involved in the hobby. That is when I got the ATV bug and began to get more involved with public displays of ATV and the schools. One thing became obvious; today's kids are visually stimulated and motivated. Look at the tremendous growth of computer games. Do you know of any kid that doesn't own or play with one? I don't. That visual spark, coupled with the new No Code Tech License, has been directly responsible for a large number of young adults and children getting involved with Amateur Radio and ATV: GROWTH.

An interesting side-effect of the future growth of Amateur Radio is that today's ham operator very often leads to tomorrow's Professional Engineer. Those engineers become tax paying, family raising and contributing members of society.

In my method of reasoning, it is far better to plant a seed of growth and prosperity now and make a greater impact later on by giving us the tools necessary to help plant that seed.

In closing, let me appeal to your good common sense; please don't take away one of the very valuable tools we Ham Radio Operators need to continue to plant the seed of growth in young and developing minds. I firmly believe that the longterm pay off far exceeds the short term discomfort or sacrifice. Thank you., Michael J. Baker, KQZ/7, Vice President, Arizona Amateurs on TV

MULTIMEDIA/MULTI CHANNEL TELEVISION DELIVERY SYSTEM ON EXISTING TELEPHONE WIRING, CABLE, RADIO & SATELLITE

NEW YORK, Jan. 27 ... Digital Compression Technology (DCT) and Stevens Institute of Technology announced a breakthrough technology today, patented by DCT. The breakthrough technology will immediately permit every telephone wired home and business in the world to receive programming equivalent to cable TV. It will allow access to the forthcoming "information highway" through the existing telephone wire systems, and through cable TV, wireless cable, and satellite systems as well, with the simple addition of an electronic selector box.

The technology, which provides for interactive multimedia services, operates in the transmission regime, is independent of any baseband source compression schedules, and makes possible a digital-rate or bandwidth compression of 16 times. Thus, telephone and cable TV systems planning to offer 500-channel capacity can now do so without ever having to rewire with optical fiber, and can upgrade their capabilities incrementally to keep pace with demand. The same gradual expansion of capacity is available to satellite systems through an inexpensive modification of existing uplink stations.

Telephone

Telephone twisted pair wiring is the most severely limited transmission means now in use. Until now, one pair of existing 26-gauge twisted pair has been unable to accommodate two way simultaneous voice, data, facsimile, and live and taped TV because of limited bandwidth of the wires and crosstalk from adjacent bundled wires.

The DCT technology breaks the bandwidth bottleneck. It further eliminates any need for expensive rewiring of the various transmission lines from the telephone central offices to the interior phone jacks presently installed in homesand offices. Analysts have estimated that over the next 15 years the rewiring of 95 million homes as well as the business offices in America, including fiber optic lines, will cost the telephone and cable companies, at present value of money, in excess of $300 billion.

With the participation of Stevens' Advanced Telecommunications Institute (ATI), DCT has developed a digital signal transmission compression technique that makes it possible to transmit individual and different programming simultaneously to various combinations of TV and different programming simultaneously to various combination s of TV sets, telephones, fax machines, and computer terminals through one unshielded, twisted pair of existing 26-gauge telephone wire. When combined with the existing switching capabilities of the local telephone companies, it would provide an unlimited program selection at the user's instant option.

The DCT technology is interactive, allowing two-way service. Thus, its basic capabilities may be used by business as well as home users for combined transmission of telephone voice, business mating and personal video conferencing, live and taped programming, taped movies, fax, computer data, interactive video games, and high-definition television (HDTV) programming, when available.

The DCT technology, which will be realized in integrated circuit chip form, is compatible with existing telephone line transmission wires and will be equally compatible with fiber optic line transmission. It will therefore allow the phone companies the flexibility of deciding if and when it makes economic sense to replace existing wiring to the poles with fiber optic lines (but it will not be necessary to replace the existing, twisted-pair telephone wires from the poles to the homes or offices.

Cable TV

The DCT technology will likewise allow cable companies, without ever having to replace coaxial cable with optical fiber, as well as those companies broadcasting via satellite, the flexibility of increasing their program-carrying capacity gradually, in keeping with market demand. Cable TV and wireless broadcasting transmissions today are analog. Digitizing the signals expands the bandwidths required to transmit them unlesssource compression methods are applied to reduce the effective digital bit rate and bandwidth. Such compression methods have been well explored, and standardization of them is underway. The DCT technology applies an additional 16 times bandwidth compression in the transmission regime to such source-compressed signals through an integrated-circuit chip: one chip for each coaxial cable at the head end.

For cable TV systems, which normally transmit 58 distinct television channels simultaneously through each coaxial cable this means 16 times 58 channels with the insertion of an inexpensive chip. Thus, the DCT technology enables provision of more than 500 channel interactive two-way capacity now. Optical fiber rewiring of cable TV systems is unnecessary; DCT chips may be inserted at the cable head-end as demand grows, rather than all at once; and the consumer may purchase a control box with a DCT decoder chip at the receiving end that would differ in a small way from the control box required for any other approach to 500-channel service offerings.

Satellite

The DCT technology applies in the same way to satellite systems. Conventional TV distribution and broadcast satellites in orbit today can provide up to 24 distinct channels of broadcast-quality, full motion video into cable head-end or home receivers. With DCT technology and simple, digital, baseband techniques in earth stations and ground receivers, those satellites could then each carry up too 384 channels of broadcast quality programming. Direct broadcast satellites planned by the industry for the near future claim up to 150 channels. These channels would be of VCR-quality only, not broadcast quality. If the DCT technology were added, over 500 channels of broadcast-quality programming could easily be carried. And, since the DCT technology is interactive, broadcast satellites would have plenty of room as well for two-way services: sound, fax, data, and video conferencing.

CONTACT Ken Kerrigan or Ruth Sarfaty, of Dan Klores Associates, 212-635-4300

IS THE FCC'S PRB-1 LEGALLY VALID?

A Court Challenge of the Legality of the PRB-1 is in the works. Success could affect all Ham antenna tower height problems throughout the 50 states.

It had to happen. What with so many hams gloating in the ham media that they had beaten "City Hall" with FCC's PRB-1, it was inevitable.

The Town of Hempstead, NY Zoning Board has denied the right of Mark Nadel, NK2T, to maintain his 55 foot antenna tower. Nadel had cited the PRB-1 in his efforts to have the Board approve the tower. To no avail. The Town has challenged PRB-1, because in denying Nadel's tower, its Zoning Board found "that the existing 55 foot tower has had a devastating effect on several of the residents. The Board has weighed the benefit to the applicant (Nadel) as against the detriment to the neighbors, and finds that the detriment far outweighs any benefit to the applicant." Essentially, this is denying the legal authority of PRB-1 as a determinant of ham antennas and antenna towers.

Nadel advised that he will go to court; while the Zoning Board says it is prepared to go to the Supreme Court if necessary.

Several results are possible in the case.

1. If the Supreme Court affirms the New York court's anti-PRB-1 decisions; or the New York courts deny the Hempstead case, and the Supreme Court reverses the New York court's decision, PRB-1 is legally "dead" in all 50 states.
2. If the Supreme Court affirms the New York court's denial of the Hempstead case; or if the New York Courts deny the Town's case, and the case is not taken to the Supreme Court, PRB-1 is legally valid in all 50 states.
3. If the Supreme Court declines to hear the New York court's decision affirming the Hempstead Town's anti-PRB-1 stand; or if the New York Courts affirm the Hempstead Town's anti-PRB-1 position, but the case is not taken to the Supreme Court, PRB-1 is legally invalid only in New York. However, other states might be inclined to follow the New York lead with probably the same results in those states.

The Source of PRB-1's Ultimate Jurisdiction

In enacting PRB-1, the FCC must get itsjurisdiction from the Radio Act of 1934 as amended, plus any subsequent Congressional Acts. However, a question resolves itself whether the 1934 Act is broad enough to include or infer the authority for the FCC to enact a PRB-1 dictating to local Zoning Boards what they may and may not do with regard to ham antennas and antenna towers.

The FCC carefully ducked that issue and substituted therefore that "there is...strong federal interest in promoting amateur communications." (Sect. 24, PRB-1) It of-

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PRB-1

fered evidence thereof by stating that the FCC (Government) does "recognize the amateur radio service...particularly with respect to providing emergency communications. Moreover, the amateur radio service provides a reservoir of...electronic experts." (Emphasis supplied.)

It is these alleged premises, which became the "peg" on which the FCC "hung its hat," stating that it "believed a limited preemption policy is warranted," and issuing PRB-1 accordingly.

Does the FCC Really Have That "Peg?"

For several very good reasons, the FCC may not actually have had the "peg" it thought it had when it issued PRB-1. Is there any proof whatsoever that all, or even a small majority of the 628,000 licensed, amateur, radio operators in this country comprising "the amateur radio service," are suitably prepared for, or even willing to participate in any particular emergency situation?

Is there any evidence that in the face of the cellular telephone, police radio, sheriff's radio, county radio, public transportation radio, private commercial radio and even broadcast radio and TV, to mention just a few generally available services, that the amateur radio service is indispensable in any emergency? Apparently the FCC had not considered these and any other available services in declaring PRB-1 to be an essential adjunct to community, emergency service.

In addition, the amateur radio service does not provide, and has not for many a year, "provided a reservoir of electronic experts, in the legal definition of the word "expert".

The field of electronics is today so huge, so all encompassing and intertwined with many other fields and disciplines, to make it virtuallyimpossible for any one person really to be an "electronic expert," which by legal definition includes being an expert in ALL of "electronics!"

So the premises on which the FCC relied for its jurisdiction to enact the PRB-1 it had, do not jibe with the facts of today's general "amateur radio service." And no effort has been made even by the Government, the FCC, the ARRL, the NARA or any of the ham media to ascertain how many of the 628,000+ USA hams are actually immediately ready to engage in emergency operations and are suitable prepared therefore right now, or possess a valid EE degree.

Since the FCC has based its PRB-1 on premises that do not exist, it follows that the PRB-1 might well fail, legally, if challenged for that reason.

This is indeed sad news for Hamdom. But that the FCC allowed itself to be persuaded to enact the PRB-1 it did, reflects on its lack of intimate knowledge of today's "amateur radio service." Perhaps the FCC should have investigated the present status of the amateur radio service vice what it was many years ago, before issuing the present PRB-1.

What Might Have Made The PRB-1 Valid?

Had the FCC issued a very limited preemption of local zoning laws to be effective only and solely on duly proven evidence presented before the Zoning Board by the "contesting" ham that he was actively interested in emergency operations, had prepared his radio station for such emergency operations as for instance by providing an alternate, emergency, power source and portable or suitable, emergency radio transmitter(s) and receiver(s)...whatever would be needed for emergency communications...then the very limited preemption in a PRB-1 written accordingly, might have stood on more solid, legal ground. Or if the "contesting" ham could produce an EE degree from any recognized institution, that too, might have provided some legal support for such a PRB-1, because the ham was indeed an "electronic expert," within reasonable limits.

What The Ham Can Do About All This

Unless the Supreme Court or the New York courts cause the PRB-1 to be invalid as described above, the hams' best bet is to pipe down with those recent media gloatings and needling of theZoning Boards. Use PRB-1 sparingly and always with empathy for any non-understanding, RFI/TVI victims of ham station activities. By all means, don't make the tower height an obvious ego trip; but keep the antenna and tower height electronically commensurate with USUAL, not extraordinary (DX?) radio communications. Then work WITH and not against the Zoning Boards. This recommendation was specifically ordered by the 8th Circuit Federal Court of Appeals in the NOMRW, Minneapolis, MN, antenna tower case, where the "contesting" has was indeed actively involved in emergency operations.

Perhaps, if this becomes a way of ham life, the ultimate, possible complete demise, legally of PRB-1 might be avoided. After all, the PRB-1 is the best device we hams have; and the only game in town.

So, let the hams not kill PRB-1 by abuse. Or by literally shoving it down Zoning Boards' throats, which would undoubtedly accomplish the same, devastating (to hams) result as the hams killing it by abuse.

FROM Voice of Ham Reason.



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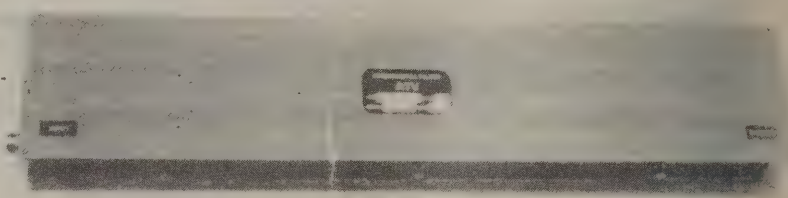
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PD-144N-2FM	144-148 Mhz.	Preamp.	Yes	FM	4-5 watts = 60W	T/R	175.
PD-220N	222 Mhz.	"	No	FM	4-5 watts = 35W	T/R	119.
PD-440N	420-450 Mhz.	"	No	Linear	½ or 4-5W = 18W	T/R	119.
PD-440N	420-450 Mhz.	"	Yes	"	½ or 4-5W = 18W	T/R	143.
PD-440N-1	"	"	No	"	½ or 4-5W = 35W	T/R	155.
PD-440N-1	"	"	Yes	"	½ or 4-5W = 35W	T/R	179.
PD-440N-2	"	"	No	"	½ or 4-5W = 60W	T/R	285.
PD-440N-2R	"	"	No	"	3-4W = 60W		199.
PD-440N-3	"	"	No	"	3-4W = 60W	T/R	235.
PD-440NM	"	"	No	"	½ W = 6W		75.
PD-440NM	"	"	No	"	½ W = 6W	T/R	118.
PD-900N	902-928 Mhz.	"	No	FM	½ W = 10W		65.
PD-900N	902-928 Mhz.	"	No	FM	½ W = 10W	T/R	90.
PD-33LHP	902-928 Mhz.	"	No	Linear	1 W = 18W		265.
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PD-33VLP	"	"	No	Linear	½ W = 1.5W		59
PD-33 Doubler 70 cm. = 33 cm.				"	½ W = ½ W		65.
PD-33 Doubler 70 cm. = 33 cm.				"	½ W = 1.0W		85.
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PD-1200N-2	1.2 Ghz.	"	No	"	1 W = 16W	T/R	205
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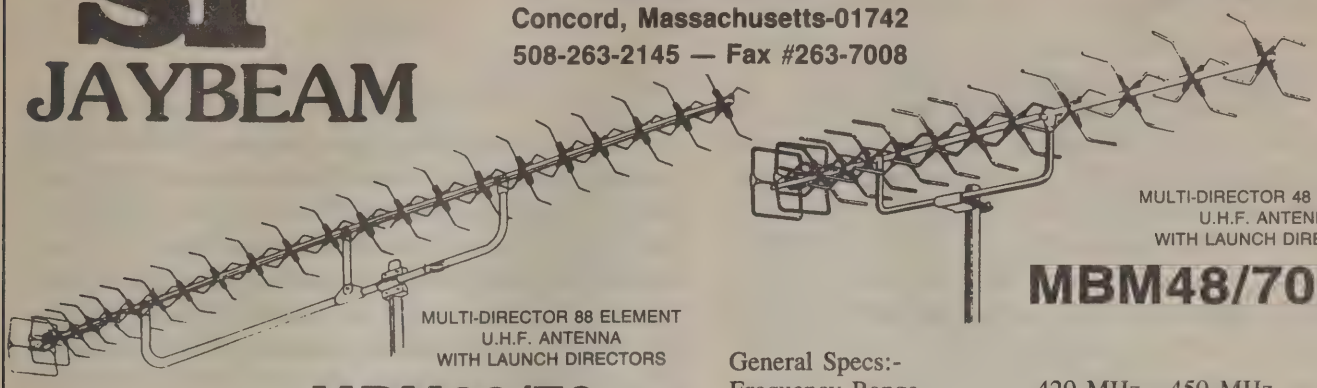
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MBM88/70cm

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MBM48/70cm

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Loss (typ)	0.1 dB	0.1 dB	0.15 dB	0.2 dB	0.25 dB	0.25 dB
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THE G6TVJ SUPERHETRODYNE AMATEUR TV TRANSMITTER

from CQ-TV, BATC
by Ian F. Bennett

Here is a design for a 23cm ATV transmitter which I have built myself with quite good results and will hopefully be of some interest to other amateurs.

Most if not all transmitter designs which I have come across appear to work in a similar way, basically a synthesized or free running oscillator at the transmitter output frequency is frequency modulated with a baseband video signa. This design differs considerably by the fact than an intermediate frequency is used, the output frequency being achieved by mixing the IF and a local oscillator, hence the term superhetrodyne. I would be interested to see any other designs of transmitters which work this way.

This transmitter can be considered as a receiver operating in reverse. This may seem a rather complicated way of doing things but a change is as good as a rest so here it is.

Circuit Description

Video Processing

The video input circuit to the transmitter is a fairly standard circuit using an EL2020 video op-amp IC. These devices have a very high bandwidth in the order of 100 Mhz and are generally better than the rather old-fashioned NE592 found in other designs. The circuit configuration is a standard non-inverting amplifier driving a CCIR pre-emph network followed by an emitter follower buffer. The video input level is varied using a constant impedance attenuator. This is a special device giving control in 0.1 dB steps but can be replaced with an ordinary pot. The op-amp is frequency compensates for high frequencies and also at the color subcarrier frequency to help compensate for losses in the modulator and the sideband filter.

Audio Modulator

The 6 Mhz subcarrier (not intercarrier) (for USA use 4.5 MHz) is generated by a simple LC oscillator tuned with variable capacitance diodes. The diodes are driven from an audio amp comprising of two NE5534 op-amps, audio pre-emph is included between them. A synthesizer circuit using an MC145151 cmos parallel synthesizer chip and a LF351 op-amp loop filter ensures that the frequency is exactly 6 Mhz. The loop filter has a long time constant to prevent the synth from attempting to remove the audio low frequencies. The subcarrier is simply resistively combined with the incoming video.

Video Modulator

The video modulator again uses a LC oscillator tuned with variable capacitance diodes similar to the audio modulator with an IF output frequency of 70 Mhz. 70 Mhz is a standard IF frequency used in commercial radio link equipment receivers, transmitters and satellite earth stations. Its use here enables the testing of the modulator into a broadcast quality receiver and also the use of a commercial 70 Mhz modulator. The modulator again uses a synthesizer to keep the output frequency at 70 Mhz. A prescaler is used as the MC145151 chip cannot handle 70 Mhz directly. The use of synthesizers simplifies the construction of the oscillators as more attention can be paid to linearity and less to frequency stability. Also, the oscillators themselves do not need stabilized supplies or fancy mechanical construction.

The synth loop filter has a long time constant to prevent the loss of video low frequencies, a problem often encountered with other directly synthesized designs. The loop filter used with a SP5060 cannot be easily tailored for video working. This transmitter design does use a SP5060, but only as a tightly controlled local oscillator which was what the chip was originally designed for. The 70 Mhz oscillator is buffered and amplified using a MSA0485 mmic. These devices work well as gain blocks even at these relatively low frequencies. The output of the modulator is taken through a lowpass filter to remove any harmonics.

SHF Local Oscillator

As the transmitter is a superhetrodyne or up-converting transmitter, it needs a local oscillator. The circuit used is basically similar to the DJ700 transmitter published in the ATV compendium, no video modulation is applied to it and the SP5060 maintains the output frequency at 1179 Mhz. The LO is amplified and then attenuated slightly to hopefully improve the return loss isolation and set the drive letter to the mixer at the required +7 dBm.

Mixer

The heart of this design is a mini-circuits SBL11 double balanced mixer. This device mixes the LO and IF together to provide the transmitter output frequency of 1249 Mhz. The use of a mixer and an IF enables the transmitter output frequency to be kept very stable with a "tight LO synth" and a "loose modulator synth", therefore avoiding the LF video distortions mentioned earlier. With this design, a free running 70 Mhz modulator could be used as any drift at 70 Mhz. It is much less overall when mixed up to 1249 Mhz.

Sideband Filter

The output of the mixer will contain both sidebands and, at these frequencies, the local oscillator also breaks through. Both these unwanted frequencies need to be removed. The filter used is an EME interdigital 3 pole device. Its response is about right and it severely attenuates the LO and low sideband frequencies to about -50 DB relative to the upper sideband. Unfortunately, the mixer output also contains many low level mixer products, all spaced at 70Mhz. These are reduced by the sideband filter but at the 1179+2x70 Mhz frequency a small amount of energy is still produced. This causes interference when using the transmitter to "look through" GB3ZZ as this frequency is 1319 Mhz. No amount of receive filtering will remove this, the only cure is better receive and transmit aerial isolation. Further filtering of the transmitter output is not recommended as the sideband filter already reduces the chrominance signal which is partially compensated for by the EL2020 feedback circuit. This spurious radiation problem is likely to make long distance repeater working very difficult. However, for simplex working, there should be no such problems.

One disadvantage with using this design is that the transmitter is not frequency agile once the filter is aligned together with the LO. This sets the output frequency. One other mixer product which also can cause problems is at 2x70 Mhz. This when frequency modulated interferes with 2 meters reception. With camera pictures or video not containing excessive hf, then the problem is minimal. The problems I experienced were mainly due to the 23cm and 2M aerials being co-sited.

THE G6TVJ SUPERHETRODYNE AMATEUR TV TRANSMITTER

Drive and Power Amplifier

The output of the sideband filter then feeds a conventional buffer amp consisting of two MSA0485 mmics giving about 14 dB of gain. The power amp consists of a Mitsubishi M67715 chip producing about 1.5 watts. The transmitter was successfully operated into GB3ZZ without the PA in circuit and an output from the driver stage of about 10MW. An interesting point to note is that the output power is et by the IF level into the mixer so the output power can be varied by attenuating the IF, something more easily done at 70 Mhz than 1249 Mhz.

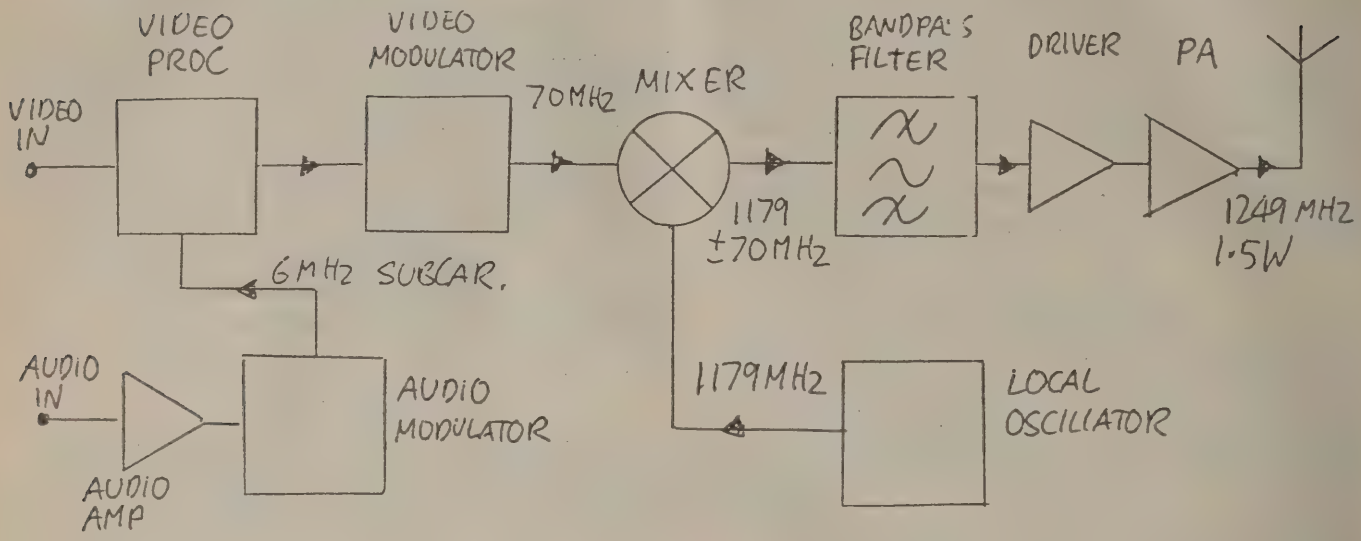
Construction

The transmitter is built up in a modular form so that individual units can be developed, tested and modified without undue stress on the rest of the assembly. The SHF circuitry is built up using 50R stripline techniques. Particular attention has to be given to the mixer, poor matching on any of its ports will degrade its performance.

This transmitter is by no means a definitive design and any comments or suggestions on how to improve it would be welcome. There are a number of particular areas which might warrant attention.

1. The mixer spurious responses are a little disappointing. The 124970 Mhz output has proved a real pain. One possible way to improve this is to surround the mixer ports with small attenuators made from chip resistors to improve the return losses. Another development might be to use a Hewlett Packard active mixer, but I have done a number of experiments with one of these with rather indifferent results. There are now devices available which operate as single sideband mixers, one of these could be used to reduce spurious emissions and improve repeaterlook through.
2. The 70 Mhz VCO output is rather harmonicy. A 140 Mhz -20DB output again causes problems at 1249+70 Mhz, the filter removes most of this energy, but it should be possible to design an oscillator with a cleaner output.

THE G6TVJ SUPERHETRODYNE AMATEUR TV TRANSMITTER



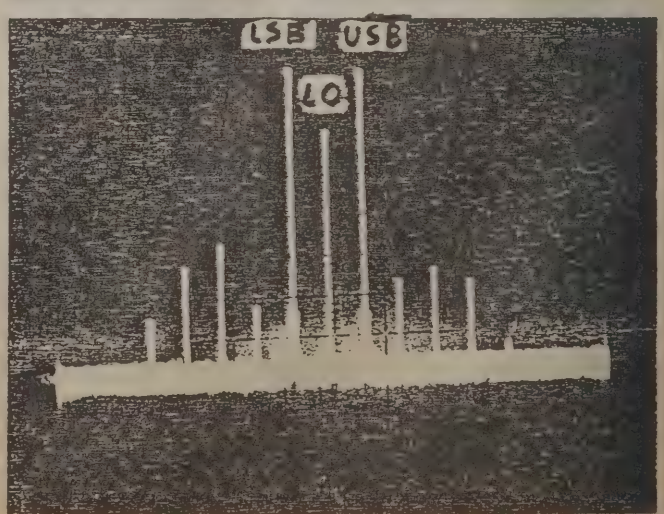
3. The video LF response of the modulator is extremely good, the EL2020 video amp is AC coupled, a split rail DC coupled design could be used to remove virtually all the AC coupling and provide an even better LF response. The use of video clamps should not be necessary in transmitters or receivers, instead better attention should be paid to the coupling of video circuits. Amateur TV places many quality restrictions on equipment, but there is no limit to the LF end of the video spectrum.
4. The synth control volts and the video baseband signal are simply resistivity combined at the varicap diodes. There may be a better way of driving the diodes from a lower impedance at video frequencies and a higher impedance at 70 Mhz. The capacitance of the diodes partially "grounds out" the video high frequencies.

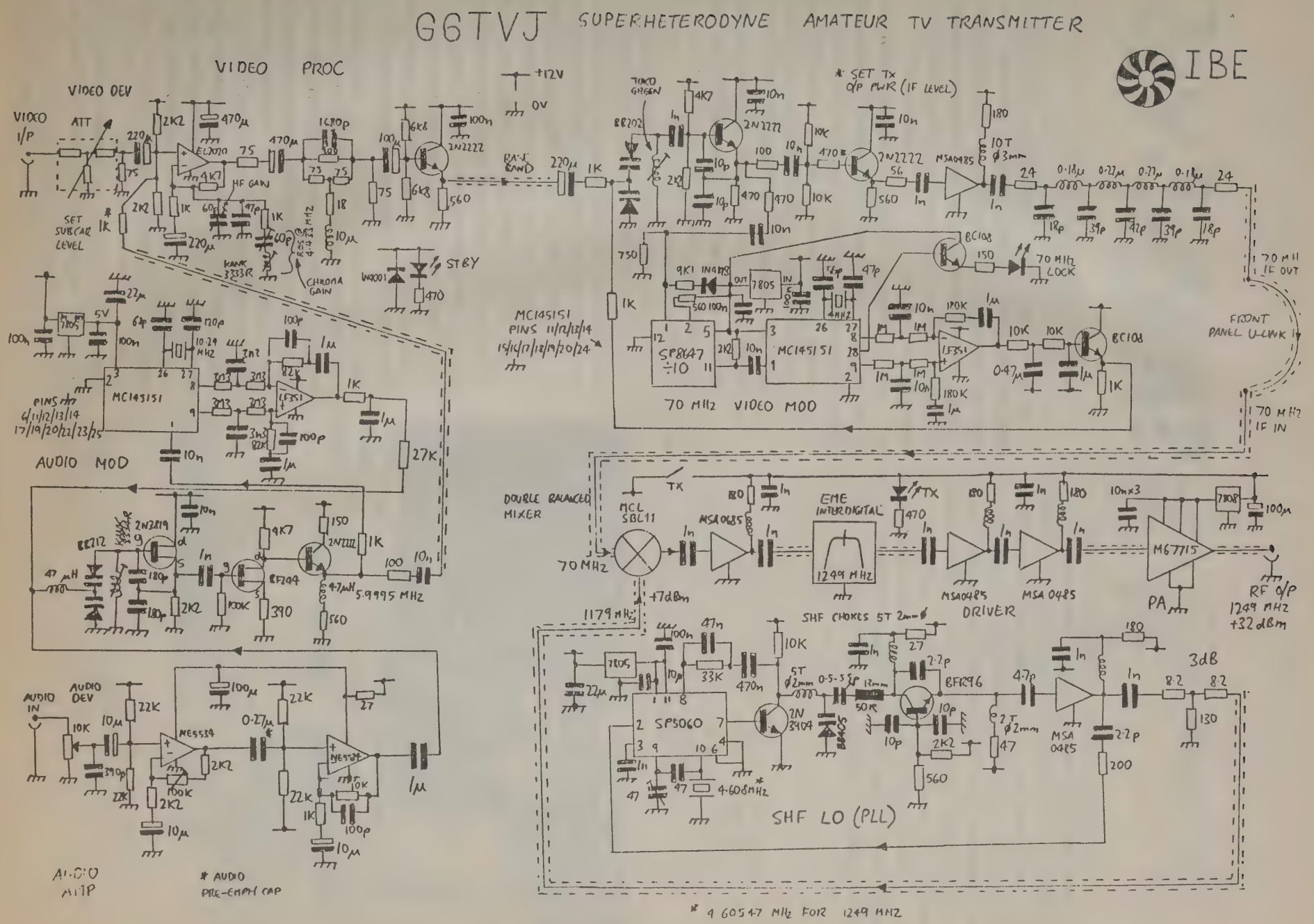
Alignment

Alignment is relatively straight forward with this design as there is no impedance matching type of adjustments due to the use of mmics in all the RF stages. The subcarrier synthesizer VCO volts are measured and the inductor adjusted to give a fairly low control voltage of about 2.5 volts. This maintains higher capacitances and hopefully less audio distortion. The same is done for the IF VCO adjusting the inductor for about 5 volts. The sideband filter has to be tuned away from the original 1296 Mhz to 1249 Mhz. This is best achieved using a spectrum analyzer but can be done with a known 1249 Mhz source and a power meter. The mixers own output cannot be used with this method because the filter may tune down to the 1179 Mhz LO or even the 1109 Mhz lower sideband with disastrous results. Alternative or homemade filters could be used, but it is recommended that a spectrum analyzer is used to ascertain satisfactory performance. This is important as too wide a bandpass or misalignment may result in significant radiation outside the 23cm amateur band. It is also wise to check the output of the mixer on an analyzer.

Conclusion

This transmitter has been now successfully operated for some months now at G0UMP's QTH (formally G6CFB) with good results. This design does have a few shortcomings and it has to be said it is rather expensive to build the PA module and sideband filter alone costing some £120 ($150), but it does represent a more innovative approach to transmitter design by using the superhet principal.




G6TVJ SUPERHETERODYNE AMATEUR TV TRANSMITTER
IBE
VIDEO PROC
VIDEO DEV
VIDEO I/P
ATT
SET SUBCAR LEVEL
HF GAIN
CHROMA GAIN
STBY
+12V
0V
AUDIO MOD
MC145151
PINS 4/11/12/13/14 17/19/20/21/23/25
AUDIO DEV
AUDIO IN
AUDIO O/P
* AUDIO PRE-EMPH CAP
* SET Tx O/P PWR (IF LEVEL)
TOKO GREEN
BB202
BC108
70 MHz LOCK
70 MHz IF OUT
70 MHz IF IN
FRONT PANEL U-LINK
MC145151 PINS 11/11/12/14 15/16/17/18/19/20/24
SP8647 ÷10
70 MHz VIDEO MOD
DOUBLE BALANCED MIXER
MCL SBL11
70MHz
+7dBm
1179 MHz
EME INTERDIGITAL
1249 MHz
MSA0485
MSA 0485
DRIVER
M67715
PA
RF O/P 1249 MHz +32 dBm
TX
SHF CHOKES 5T 2mm ϕ
SP8060
2N3904
BFR96
4·608MHz
SHF LO (PLL)
3dB
* 4·60547 MHz FOR 1249 MHz

from ATOM

SKY EYE

Rich Bono, NM1D

There was life before Amateur Radio. Before I was a licensed Amateur Radio operator, I spent most of my late childhood days building and flying model aircraft. Many of you wanna be pilots probably started as I did, with your gleaming blue and yellow Cox PT-19, making yourself dizzy as you continued to try and convert that string controlled 'aircraft' back to its basic elements, small bits of blue and yellow plastic.

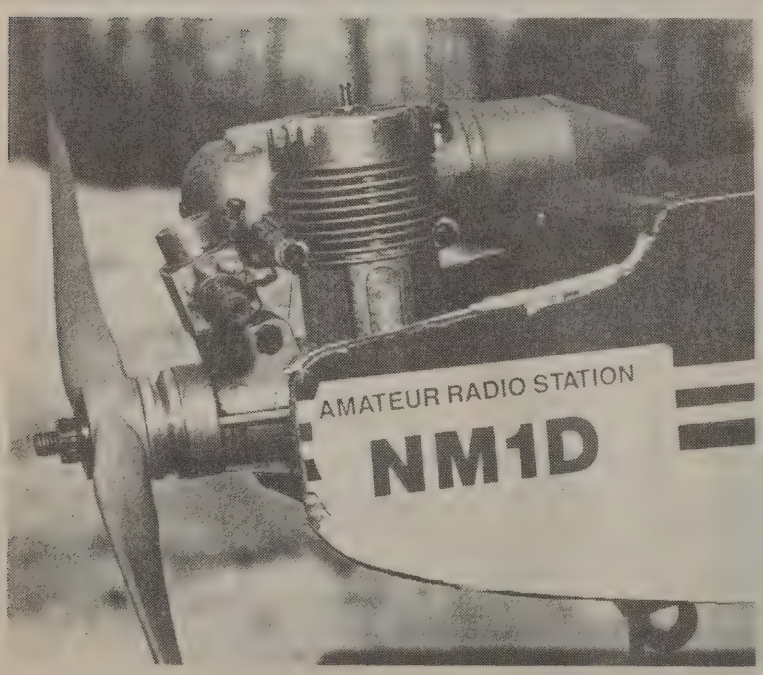
As I 'matured', I started building planes out of wood (mostly balsa). I found out that these actually flew (those blue and yellow plastic things were closer to tethered projectiles, than flying aircraft). I really enjoyed building and flying model aircraft. Toward the end of my teen age years, I was starting to learn to fly radio controlled model aircraft. I thought this would be great, no more strings and dizzying circles! What I didn't realize is that it is very difficult to learn to fly one.

Being stubborn, a friend and I kept trying to learn to fly. I think that in a couple of years we went through more tubes of five minute epoxy than the original weight of the aircraft. In the end, we never did learn to be successful at flying these things! No, it wasn't that we gave up, or that we ran out of money, time, or desire to learn to fly. But mostly I think it was our hormones. We seemed to discover girls and cars. And both seemed to take up all of our time and more money than we could earn!

So as not to continue this as an autobiography, let me skip ahead. We now find that I have been married for 15 years or so. I've been a licensed amateur radio operator for about 20 years. I've got some spare time now, and somehow I seem to find that I have a little spare money (please don't tell the IRS). I've tried almost everything possible in ham radio, except maybe moon-bounce. I've taken up new hobbies such as scuba diving.

Denise and I somehow found out that there was a radio controlled model flying field right in downtown Derry behind the industrial park. She knew that I used to build and fly model aircraft because there are still a couple of these hanging around the house from my earlier teenage years. We used to go to this field on summer weekends to watch the pilots fly their aircraft. Boy, did that bring back memories. Just smelling the heavenly mixture of Methanol, Nitromethane, and Castor oil again (model glow engine fuel) was very stimulating!

One of the pilots noticed that we were almost becoming regulars at the field, asked me if I wanted to try and fly his plane. I respecffully declined as my memory was filled with that airplane from so long ago that ended up being more epoxy glue than balsa. Denise mentioned that I should get back into this hobby since I used to enjoy it so much.



Amateur Television takes to the air with Rich Bono NM1D Flying Amateur Radio Station. Rich will be our guest speaker at the ATOM Meeting Wed., April, 20 at 7 p.m. see inside for details.

SKY EYE

I responded that I'd like to, but barely have enough time to devote to ham radio, photography, and SCUBA diving now. The last thing I needed was another hobby!

Wouldn't you know it, the next winter a fellow at work was interested in getting into flying models. We talked about it, and decided that it would be fun to do this together. So we went off and purchased identical planes.

But this time I did it right. After remembering all the time I spent climbing trees as a teenager, trying to recover my early flying epoxy plane (I figure that I helped develop the idea of the now high technology composite aircraft). I decided that an instructor was mandatory, and we joined the R/C club that was located in the town (The New Hampshire Flying Tigers R/C Club). This club has a special training program. They dedicate two nights a week to instruction, and always have qualified instructors available.

By now you must be asking what this has to do with Amateur radio! Here's where the start to mix. Being the talkative type that I am, during the learning process of trying to get my aircraft to a stay in the air when I wanted it there, and back to the ground when I wanted it there, I would have meaningful conversations with the flight instructor:
Keep the nose level, Rich . . .
OK . . . How's that?
That's better . . .
You know I'm also a Ham radio operator
That's nice.
Yeah, *I'm going to put* a TV camera *in a plane so we can see the view* from *the aircraft!*
But first you need to learn how to fly!
Oh yeah.

Well, I finally did earn my wings, and can now keep the aircraft from hitting most trees. So when I was done using my training aircraft for learning to fly, I decided that it would be qreat to *use* it for some R/C ATV!

I searched around for small, light ATV equipment. I found a micro black and white camera that was about 1 inch square, and only needed 7 to 30 Vdc to operate. I also found a small ATV transmitter on 434 MHz, it requires 9 Vdc and is on a circuit board that is about 1 inch square and outputs about 80 mw of RF energy. I can power both the camera and the transmitter board with a single 9 volt ~transistor radio' style alkaline battery.

I had to shield the transmitter, and my R/C receiver (the R/C equipment operates on 72 MHz). I built a simple dipole antenna for 434 MHz. I tape the dipole antenna to the wing of the aircraft, and place the transmitter, and the 9 volt battery inside the aircraft.

I did have to solve some interference problems with the R/C equipment. By placing the ATV antenna perpendicular to the R/C receiving antenna, and using some ferrite bead filters on the wiring inside the aircraft, I was able to minimize the interference.

The extra weight did affect the perfommance of the aircraft, but it still flies pretty well. Many people were surprised that I was able to do this in a small "forty srze" trainer aircraft. Others who have attempted this have had to use much larger, specially designed aircraft.

I simply rubberbanded the camera to the wing, or to the landing gear and got great results. I found that my cable ready TV, set to cable channel 59 provides a better picture than my down converter! I started using a yagi antenna, with a friend aiming the antenna at the aircraft. But I changed to using a simple quarter wave magnet-mount antenna for the receiver. I modified the magnet-mount antenna by feeding it with low loss 9913 coaxial cable to minimize feedline losses.

I have brought a VCR to the field to record many of my flights. It is a lot of fun, and now you should hear the comments of the other R/C pilots. They start by saying "What are you doing?", then go on with, "No way that won't work" and end up with "WOW, I don't believe it, what great pictures!"

I'd love to switch to a color camera but the camera alone cost about $800! Maybe someday. For now, I am having fun with the black and white camera. This year's project improves on my original set up by mounting a camcorder viewfinder on a baseball cap. This will allow me to look though the viewfinder while I fly the plane.

ATOM, Amateur Television of Manchester, 175 Crosbie St., Manchester, NH 03104, is an excellent club newsletter. The issue from which the Sky Eye and The Machine article appear features a full color cover, nice magazine enamel paper, and several photos we did not reproduce here. A first class effort!

The Machine

Ron Baker WB4HFN

Well I was asked to write an article about the ATV repeater so here goes . . .

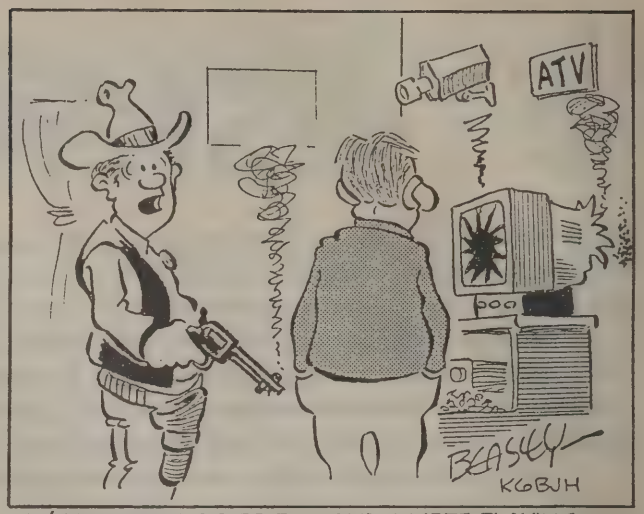
The repeater was originally constructed during the summer of 1992 and went on the air for the first time in November 1992. It currently resides on top of Warner Hill at the QTH of Mark, N1KNC, in Derry. The antenna is up about 100 feet on Marks tower for a total elevation of about 650' ASL. The entire repeater is housed in a portable 19" rack cabinet aholn 1R" tall.

The transmitter, (439.250 MHz), is a PC Electronics TXA570 transmitter, a FMA5-E 4.5 MHz subcarrier module and the PA-5 power amp running 10 watts of peak power. The transmitter has two audio/video inputs that are selectable via DTMF tones from the command receiver. The Time-Out Timer is set to activate 15 minutes after the transmitter is keyed and is reset when the transmitter carriers dropped. The meter on the front panel measures peak transmit power.

The receiver (426.250 MHz) is a Spectrum downconverter with an output at TV-IF. That output is feed to a PC Electronics VSB45 TV-IF to base band video board. The receiver does not have a preamp and requires about 150 uV of signal to decode a watchable picture. So far I have seen good pictures from the repeater input signals as far away as Lowell, MA and North Andover running under 10 watts.

The repeater controller contains the Hamtronics DTMF tone decoder board with 7 output functions which is accessible to the users for various functions. The controller also contains 3 Channelmatic DTMF tone decoders prog rammed for sysop functions. The built in character generator and color bar generator is the WB8ELK video board. The 1000 cycle tone generator, Rich/NM1D is quite fond of that item, is a simple LM741 op-amp oscillator. Currently 4 of the seven user functions are available which includes transmitter key with identification, transmitter key color bars, transmitter enable/disable and alternate video source select. This last item will be used to switch a remote receiver monitoring the ECAT ATV Club repeater in North Andover on 911.250 MHz.

As of this article, we now have a fully functional auxiliary transmitter on 923.250 MHz. This transmitter is the PC Electronics TXA5-33 1.5 watt board with the FMA5-F 4.5 MHz subcarrier board. When the repeater is moved to the hill' I hope to have an output in the 900 MHz band. I think this output will be much cleaner than the output at



OL' ED, ON THE OTHER END, AND I WERE PLAYING "QUICK DRAW," AND I THINK I LOST

439.250 MHz because of all the interference in the 440 band. Even though its low power that 1.5 watts will go quite the distance at that height. It should give us watchable pictures in Derry with a good antenna.

As far as future plans for the repeater, with the donation of a new transmit antenna by Bill Wagner, WB1ADF, we all will be seeing better pictures in the future. Again, I want to thank Bill for the donation, we all will appreciate it for many years. Other plans in the works include a video AGC board which will give us a constant picture level to the transmitter. With this installed it shouldn't make any difference if your input signal is under-modulated or over the output, modulation level will remain at the proper level. I am trying to convert a tube type UHF power amp for class AB operations. If I am successful this should give us about 90 watts of peak power.Well that's it for this month, so Happy ATVing and HOPE TO SEE YOU IN THE PICTURES.

N1FIL @ via Packet WA1WOK, NH, USA, NA or TO
Dick St. Jean, **100 Gilhaven Road, Manchester, NH 03104**

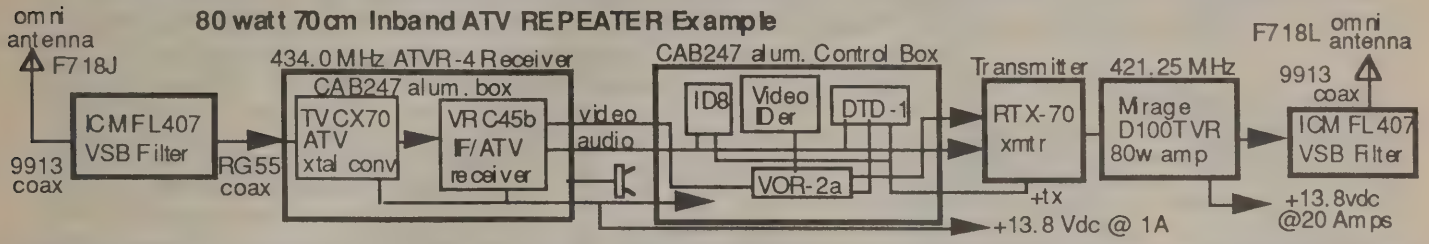
Bill Wagner (WB1ADF) is shown here presenting a Diamond vertical F718 J freq. 439.250 omni 9.3DBD gain antenna to Ron Baker (WB4HFN) to be used on the ATV repeater. This presentation was made March 16th at the monthly meeting of the Amateur Television of Manchester at the 4H Club House on Brown Ave in Manchester. All donations made to support the activity of Amateur Television repeater system is greatly appreciated. Remember our goal in ATOM is to support ATV for educational, community service and experimental aspects.

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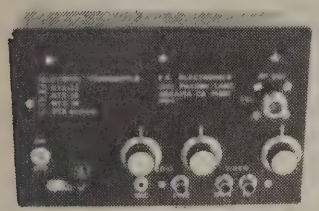
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READY FOR AN ATV REPEATER OR LINK IN YOUR AREA?

WE HAVE THE MODULES AND SOURCES FOR INBAND OR CROSSBAND

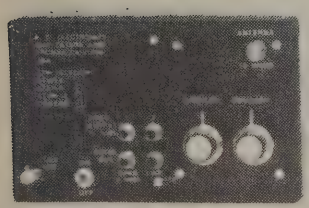


Select an RTX Transmitter and a ATVR Receiver for the bands you want, add the appropriate linear amp,VSB filters & antennas, ID & VOR-2a, power supply and coax for your own repeater. We suggest low in / high out for crossband. Ask for a copy of our 8 page ATV Repeater App Note including recommended sources of filters, antennas, video IDers, etc. before you start so you can do it right the first time. Most can put together a good working ATV repeater for under $2000.



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ATVR-12 specify frequency - 1253.25 link, 1277.25 repeater input.....**$329**

VOR-2a Video Operated Relay board...$45, keys RTX upon detection of horizontal sync plus 10 min. & end of transmission momentary relay for switching to video ID to meet FCC regs. Pots for sensitvivity, hang & ID time. 1.75x3.5".
ID-8 Automatic Morse Audio Identifier...$89, Communications Specialists board has 8 programmable and selectable messages up to 200 characters, CW 1-99 WPM, ID time 1-99 minutes, and more features in Non-volatile EEPROM memory. Includes programming key pad. Output up to 4 V p-p. Size 1.85x1.12x.35. Req. 6 to 20 Vdc @ 6 ma.
DTD-1 DTMF Decoder...$59, Communications Specialists board decodes up to 4 programable digits for latched or momentary relay driver output. Use for remote repeater on/off, video switching, etc. Size 2.0x1.25". +7 to 16 Vdc.
LMB CAB 247 7.3x4.7x2 die cast aluminum box. Great for control housing VOR-2a, DTMF and ID boards...**$20**

ANTENNAS When comparing prices remember ours include delivery by UPS surface in the contiguous USA.

70cm
F718 (L,J,A - specify video carrier frequency) Diamond vertical omni 9.3 dBd gain, 15 ft long.....**$224**
440-6X KLM 8.9 dBd gain 420-450 MHz 6 element beam. 28" boom, end mounted.....**$60**
COY4327EL Swiech 10 dBd 420-450 MHz 7 element beam. 4 ft boom, end mounted.....**$60**
440-10X KLM 11.2 dBd gain 420-450 MHz 10 element beam 64 " boom, end mounted.....**$74**
440-16X KLM 14.2 dBd gain 420-450 MHz 16 element beam 10.5 ft boom, center mounted.....**$134**
FO22-ATV RUTLAND 15.8 dBd gain 420-450 MHz 22 element beam 14 ft boom, center mtg.....**$115**

33cm
FP-19 Comet vertical omni 10 dBd gain, 7 ft 4 in long. Covers 902-928 MHz.....**$119**
3318LYARM Downeast Microwave 14.2 dBd gain 902-928 MHz beam. 6 ft boom, end mounted....**$82**

23cm
F1230 Diamond 1200 MHz band vertical omni 11.3 dBd gain, 10.5 ft long**$163**
2424LYRM Downeast Microwave 16.2 dBd gain 1240-1300 MHz beam. 6 ft boom, end mounted..**$82**

* **DOWNCONVERTER DISCOUNT** of 10% is available to Repeater groups and clubs if you order 5 or more per item of the tuneable downconverters on pages 4 or 5. Special discount for Teacher Hams who will use ATV in classroom. The order must be sold and shipped to one person at one time. It helps to have some extras available for new people to try out your repeater or use at demos at other clubs and schools. Higher quantity discounts: 5-24 =10%, 25-49=15%, 50-99=20%, 100 up=25%.

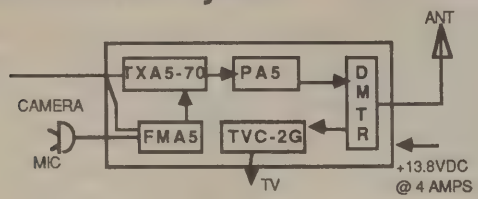
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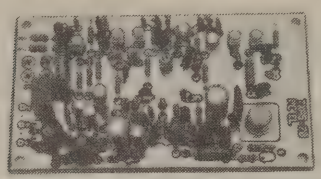
ELECTRONICS

BUILD YOUR OWN 10 WATT ATV STATION

Basic 10 Watt system - 3 Transmitting modules as seen in the Handbook

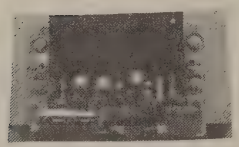


See chapters 20 & 7 in the *ARRL Handbook*. These modules are the latest upgraded generations. Mount the boards & parts for a 10 to 15 Watt basic module ATV transceiver in a 3x8x12" aluminum chassis for shielding and heat sinking. Use the DMTR module to switch 50Ω 70cm antenna between PA5 amp & downconverter. See the TVC-2G Downconverter module [illegible] Schematic & layout comes with each module.



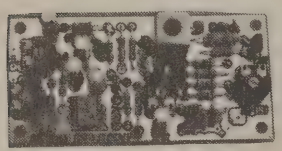
TXA5-70A 4.0"x2.25"

TXA5-70a ATV EXCITER/MODULATOR.....$89
Replaces TXA5-5. Smaller board for stand alone portable or R/C applications in addition to 10 Watt systems. Wired and tested board. Adjustable 50-80 mW output to properly drive the PA5 10 Watt and 100 Watt power amps. Accepts standard 1 volt composite video from color camera, VCR, computer, etc. Wideband modulator gives excellent color and high resolution. Built-in sync stretcher, Draws 70 mA at 13.8 Vdc. One crystal included, but relay switch between 2 sockets. **Extra crystal $15.** We stock 439.25, 434.0, 427.25 & 426.25 MHz, other 70 cm freq. may take 4 weeks to special order xtal. 100 Ohm carbon panel pot for video gain **$5.**



PA5 3.5"x2.0"

PA5 10 WATT P.E.P. ATV POWER MODULE.....$99
An all mode Toshiba S-AU4 is mounted on a heatsink with a stripline PC board to output over 10 Watts p.e.p. when driven by 80 mW from the TXA5-70. 50 Ohms in & out. Broadband, 420-450 MHz, linear, no tuning. 250 mW max RF input, do not use with 1 Watt modules. req. 13.8Vdc reg. @ 3 amps.



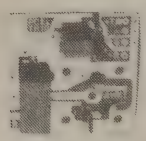
FMA5-F 3"x1.5"

FMA5-F AUDIO SUBCARRIER GENERATOR.....$39
Temperature stablized VCO with adjustable deviation to more than 25 kHz. Transmits broadcast standard sound with your picture. Accepts a Low Z mic (100-600 Ohms), also line level audio from VCRs, camera mics, computers, etc. Up to 1 v pk-pk drive to the TXA5-70, TXA5-RC or TXA5-33 exciter modulators. Works with any transmitter having 5 MHz modulation bandwidth. Draws 20 ma from 13.8 Vdc supply.



DMTR 2.2x2.2"

DMTR-70-10 T/R RELAY, DETECTOR & MONITOR.....$45
T/R switching for up to 15 Watt 70cm ATV systems. Negligible insertion loss, 60dB isolation. Mounts on flange type UG58 N chassis jack ($2). Relays for switching + power to all basic modules, camera video in rec. to detected output video in xmit. to monitor. 2.2x2.2". 13.8Vdc @ 120 ma.



TR-10 2 x 2"

TR-10 70cm T/R RELAY BOARD.....$29
Simple RF T/R relay and up to 1A +13.8 power relay. also has RF test point.

420-450 MHz ATV DOWNCONVERTERS

GET STARTED WITH ONE OF THESE TO *SEE* THE ACTION!

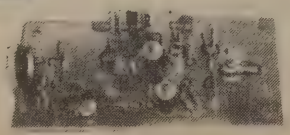


Space Shuttle video



TVC-4G

TVC-4G PACKAGED DOWNCONV. with AC supply.....**$89**
Contains the sensitive TVC-2G board in a black die cast 4.7x3.7x2.1 inch aluminum box ready to go with 120 Vdc 60 Hz to 12Vdc 100 ma. wall plug power supply. N connector antenna input and F output to TV. Companion downconverter to our TX70-1b transmitter and other TX boards. TVC-4G is handy for ATV portable, mobile, demos, or getting a friend on. Also used in community pay TV systems outside USA.



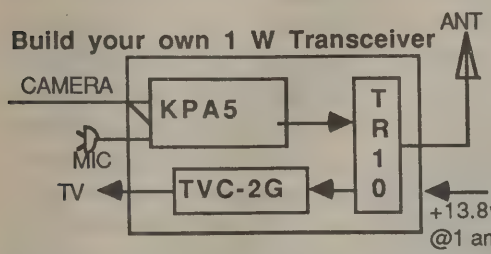
TVC-2G 2"x4"

TVC-2G GaAsFET TUNEABLE DOWNCONV. BOARD.....$49
Wired and tested module connects between 70cm antenna and TV set tuned to channel 2, 3, or 4 (special order 45.75 MHz IF or LVSB). Varicap tunes whole 420-450 MHz 70CM amateur band. Sensitive 1 dB NF dual gate GaAsfet used in both the preamp and mixer stages. 25 dB gain. Requires +11 to 18 Vdc @25 mA , shielded enclosure, knob, 10K pot, switch, fuse and connectors.

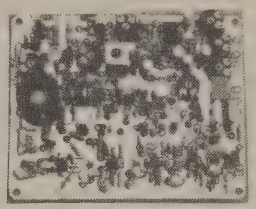
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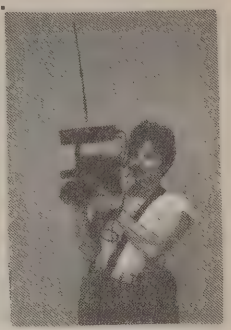
THE "KREEPIE PEEPIE" ATV TRANSMITTER

THIS IS THE ATV TRANSMITTER BOARD YOU HAVE READ ABOUT THAT HAS SURVIVED MANY BALLOON FLIGHTS TO OVER *100,000 FEET* AND BACK. ALSO USED FOR R/C MODELS WHERE AN ALL IN ONE BOARD WITH SOUND IS DESIRED OR DEDICATED LINKS AND REPEATERS. JUST THE THING FOR THE BUILDER WHO WANTS TO PACKAGE AND MAKE HIS OWN PORTABLE 70 CM ATV TRANSMITTER OR HOME TRANSCEIVER WITH A WIRED AND TESTED BOARD.









KPA5-F board only $169

KPA5-F 70CM ATV XMTR BOARD FEATURES:

- 1.5 Watts P.E.P. typical RF output. Run barefoot for portable, but if needed for greatert DX, the output properly matches the Mirage D15N 15 watt, D26N-ATV 50 Watt linear amp for full output or D100TVN to over 70 Watts with its adjustable sync stretcher. Same board as used in TX70-1b.
- FULL COLOR AND SOUND on a small 3.25 x 4" board
- Wired and tested board runs on external 13.8 Vdc @ 300 mA. supply or 12 V battery. Weighs only 3 oz.
- Accepts composite video from cameras, camcorders, VCRs, computers, etc. 2 audio inputs, one for low Z dynamic mic, & one line level from most cameras & VCRs. Transmit monitor output enables seeing your own true RF detected video.

KPA5 APPLICATION:

PORTABLE CORDLESS TV CAMERA. Think of it as a video HT. Place the KPA5 in one of the L.M.B. Diecast aluminum boxes, AEA HR-4 half wave "hot rod" on top or at the end of 50Ω coax attached to a headset. Plug into a 12-14 v source such as a 12 Vdc battery pack. Depending on terrain & receiving antenna DX is typically over 1 mile. Then at home with Rutland FO22-ATV antennas at both ends DX is >22 miles snow-free line-of-sight.

Price only $169 supplied with one crystal on 426.25, 434.0, 427.25 or 439.25. 2nd xtal add $15. Has 2 relay switched crystal sockets. Specify frequency(s) when ordering, check with local ATVers, ARRL Repeater Directory or call us. Sold only to code free Technician class or higher licensed radio amateurs.

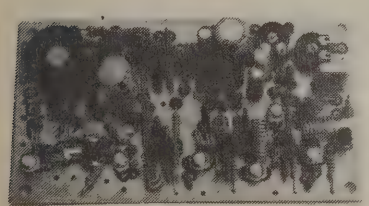
ACCESSORIES:

L.M.B. CAB247 7.3x4.7x2" roomy aluminum box.....**$20**
CAB234 4.6x3.6x2" aluminum box, smaller tighter fit.....**$13**
100 Ohm carbon panel pot for video gain control.....**$5**
TR-10 RF T/R relay module, mounts on chassis N conn.....**$29**
TVC-4G..$89 or TVC-2G..$49 Downconverter (pg 5)
RG174 50 Ohm 1/10 inch dia. coax cable, 6ft.....**$3**
MIRAGE D15N-ATV 1.5 in /15 out all mode amp.....**$176**
MIRAGE D26N-ATV 1.5 in / 50 out all mode amp.....**$249**
MIRAGE D100TVN 1.5 in/70 out all mode amp.....**$364**

AEA HR-4 "Hot Rod" half-wave portable antenna.....**$24**
450 ISOPOLE omni 4 dBd vert. gain antenna.....**$89**
KLM 440-6X 8.9 dBd ant., 28" boom, >50 deg. BW.....**$60**
KLM 440-10X 11.2 dBd, antenna, 64" boom.....**$74**
RUTLAND FO22-ATV 15.8 dBd antenna, 14 ft boom...**$115**
UG21 type N male connector for Belden 9913 coax.....**$5**
UG58 N female flange type chassis connector.....**$2**
800J 10 pin VHS color camera chassis connector.....**$10**
800P 10 pin VHS color camera cabie male plug.....**$15**

SMALL TXA5-RC 1 WATT ATV TRANSMITTER.....$129

Designed primarily for Radio Control models, rockets, balloons, etc. with it's small 2.25 x 4 inch size and 2 oz. weight. Adjustable power output from 1.5 p.e.p. to 100 mW. Draws 350 MA @ 13.8 Vdc and 1 Watt, 200 ma at 100 mW. Has adjustable sync stretcher and provisions for sound from the FMA5-F board (pg 2) in case your application needs higher power sometimes or subcarrier sound. Comes wired and tested ready for you to mount in a shielded enclosure, connect up coax from antenna and camera and wires to power source. Plan on shielding your R/C receiver and adding the simple antenna low pass filter supplied with the application note. Receive with one of our 70 cm downconverters listed on page 5 and a TV set. Specify freq., 426.25 MHz suggested for R/C, other standard ATV freq. avail.



TXA5-RC 2.25 x 4"

See page 8 for mini cameras

TXA5-70a board can also be used for R/C applications where 2 frequency capability is desired. Same size as TXA5-RC but 80 mw.for .25 to 5 mile DX, or add 10 Watt PA5 amp for 3 to over 100 mile line of sight DX. See page 2....**$89**



ATVM-70 Transmitter MSC-2 Sound

MICROTEK ATVM-70 MINI ATV transmitter board.....$129
Only 1.0 x 1.3 inch, wired and tested board. See article in July 91 73 Magazine page 9. Nominal output 80 mw. Capable of driving the PA5 for higher power. Requires 7.0 to 10.0 Vdc maximum at <100 ma. Only 434.0 MHz is available with the SAW oscillator. Also Great for R/C models, robots, demos or short links. Snow free line of sight DX1/4 mile dipole to dipole or up to 5 miles with Rutland FO22-ATV antennas.
MSC-2 companion 4.5 MHz sound subcarrier board, same board size as ATVM70.....**$59**

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Hams, call now for our complete 10 page ATV catalogue.

REPEATER ACTIVITY FROM MY WORKBENCH

Art...WA8RMC

Well, Christmas is a done deal...the lights are down and the car still isn't fixed. How's that for a rounded out burst of activity? Now that (I hope) winter is finished, all of us will turn our attention toward the activities of the warmer season. Let's see now...what is the first ham activity that you can think of for the upcoming good weather? Right! It's antenna weather coming up. Good timing too. This issue should give you some ideas toward improving your incoming signal. Its also time to be focusing on improved repeater incoming signals too. How is that for a good intro?



One of the first activities that Ken and I plan to do is install the repeater receiver and antenna on Channel 10's tower. We have permission to put the antenna at the 400 foot level on their tower. Since coax is already run, all we have to do is install the receive antenna and preamp and connect it to the existing Belden 9913 down to the control unit at the base. A 910 Mhz antenna will be installed at about the 50 foot level to link the signal to the downtown repeater. Hopefully then all ATVers will be able to access the repeater with P5 signals.

The next project (well it has been an ongoing one since the first of the year) is to complete and install the airport radar link. I finally got written approval from the company that controls the signal (Kavouras Inc) to allow us to retransmit the radar signal. The were very receptive to our initial idea but to get them to put it in writing took more effort. In exchange for our free use of the signal, I promised to promote their service as much as I could. Well, here's the start. Next the control unit and transmitter has to be finished. It is about 90% complete but it seems that the closer to the end I get, the longer it takes.

There's got to be a Murphy Law involved in this somewhere! A significant step toward link 910 Mhz transmitter construction was to determine the sufficient power level required to maintain P5 communications. Bill Parker W8DMR set me straight on the proper formula to use and to my surprise I didn't have enough power. Now, at this point I pondered the options...move Port Columbus closer to downtown? No...that won't do. More gain to the downtown antenna? Well, maybe but I need another 12 DB. The existing antenna has about 6-7 DB gain. Since I don't know how to build an 18-19 DB omnidirectional antenna, the only thing left is more power at the airport end. I found a "linear" Motorola brick that takes 100mw in and outputs about 8-9 watts. This should do the trick. All well and good so far but after I received the brick, I found pin 1 (RF input) broken. It's back to the supplier for a replacement and not back to me as of this writing. I promise a construction article about this when I'm finished. This should be a low cost way to get into the 6-7 watt range for 900 Mhz AM ATV. More later.

Ken and I went down to the repeater a couple of weeks ago to touch up the sound calibration. The 4.5 Mhz subcarrier was far enough off to make it difficult to copy the audio. We made it better but some objectional hiss remains. We didn't intend for the trip to be a fix all mission so more improvements are to come. Sometime in the near future we want to pull the whole unit for some offsite repackaging and major refinements. We found that equipment built onto a horizontal plate with a vertical front panel looks real good but is very difficult to service. Let this be a strong message to all of those contemplating construction of a new repeater. Build it so all controls are accessible in the rack or whatever you mount it in. **ALL HAM BUILT EQUIPMENT NEEDS ADJUSTMENTS.**

That's all for now...I think I've rambled on long enough. Besides the page is almost full. I've got to leave room for other topics. ***from the ATCO newsletter.***

NEW LOW-LOSS CABLES FOR MOBILE RADIO SYSTEMS

New cables with low-loss foam dielectrics and combination foil-braid outer conductors represent the first important advance in low-loss cables in more than 10 years.

from Mobile Radio

By Joe Lanoue & Robert Perelman

Low-loss coaxial cables are ideal for antenna feeders and interconnects in land mobile, cellular and paging systems. The traditional choices have been foam- or air-dielectric cables with corrugated-copper outer conductors and air-dielectric cables with combination foil-braid outer conductors.

Corrugated-copper cables are expensive. They require special connectors and are stiff, making them difficult to install. Recently, air-dielectric cables with foil-braid outer conductors have gained popularity because they are less expensive than corrugated-copper cables, they use inexpensive standard connectors, and the have good flexibility.

Even so, air-dielectric cables have shortcomings. Their construction typically consists of a center conductor with a strand of polyethylene wound helically around it, a tube of polyethylene extruded over that combination, a bonded foil and braid outer conductor over that and, finally, a polyvinyl chloride (PVC) jacket, as shown in Photo 1 (third from the top). Because the cable has a continuous air space along its length, moisture can accumulate inside and degrade the cables' electrical performance when it is installed outdoors. The center conductor is not bonded to the dielectric, so it can move toward the outer conductor when the cable is bent, changing the cable's electrical performance.

Temperature changes can cause the center conductor to protrude from the outer conductor, especially when the cable is outdoors. This protrusion can prevent the connector on the cable from making the proper contact with its mating connector.

Air-dielectric cable is available in a 0.405" diameter with attenuation approaching that of a 1/2"-diameter corrugated-copper cable. For applications requiring lower loss, corrugated-copper cables were the only solution- until now.

A new series of cables fills the gap. Low-loss foam dielectrics and foil-braid outer conductors give the new cables losses comparable to corrugated-copper cables at a much lower cost. They use inexpensive connectors that are modified standard RG cable connectors. The cables are available in sizes ranging from 0.200" to 1.670" in diameter, but this article focuses on the LMR400 0.405" and LMR600 0.590" sizes, which were developed first.

The new cables avoid the problems of air-dielectric cables through the use of a proprietary, low-loss, polyethylene foam. The result is loss lower than for an air-dielectric cable of the same size and virtually identical to that of a corrugated-copper outer conductor cable of the same size. The foam materials and processing have been developed to maintain good strength so that the cable is rugged enough to withstand normal installation. The use of a foam instead of an air dielectric eliminates problems with moisture ingress. By bonding together all of the cable components, problems with differential expansion and conductor migration during bending are also avoided.

The jacket on these cables is black, low-density polyethylene with 3% carbon black added for ultraviolet light protection. The is the same jacket material commonly provided on corrugated-copper cables, and it has proven to be durable for outdoor installations, with a life expectancy in excess of 20 years. Air-dielectric cables are commonly provided with PVC jackets of various types. These exhibit less weather resistance thanpolyethylene and, if not properly formulated, can result in degradation of electrical performance over time due to migration of the plasticizer into the dielectric.

The biggest difference between the new cables and the corrugated-copper cables is the outer conductors. Corrugated copper is a proven performer in outdoor applications. So is foil-braid-this basic construction has an excellent record of trouble-free service in millions of feet of cable TV (CATV) drop wire installed during the past 20 years. In the new cable's construction, the aluminum tape is bonded to the polyethylene dielectric. This bonding avoids the air gap found between the outer conductor and the dielectric on corrugated-copper products and provides a reliable moisture barrier to protect the dielectric. Extensive humidity testing has been done on these cable constructions to verify that there is virtually no change in their electrical performance over time in a harsh outdoor environment. A high-coverage tinned-copper braid is applied over the aluminum tape for mechanical protection and for connector attachment.

The construction results in excellent RF shielding and phase stability over temperature. The foil-braid outer conductor of the new cables and of air-dielectric cables provides better than 90 dB of RF shielding, which is more than adequate for most applications. Corrugated-copper cables provide shielding well in excess of 120 dB. When the highest possible shielding is required, corrugated-copper cables may be required.

Phase stability with temperature is mainly a function of the dielectric material used in the cable. Both the common corrugated-copper cables and the new cables use similar low-loss polyethylene foams and have excellent phase stability with temperature-typically better than 10 parts per million per degree Celsius.

When bent excessively, the corrugated copper cables kink easily, causing permanent damage. The new cables us a thicker jacket to provide strength and are virtually immune to kinking.

Crimp and clamp connectors are available for the new cables. The use of a high-coverage braid combined with an adhesive-backed shrink tube results in a high-strength, weather-proof interface between the cable and the connector. For the 0.590"-diameter cable, typical connector pull-off strength is in excess of 100 pounds.

Connectors for the 0.405"-diameter air-dielectric cables also will fit the new cable with the same diameter. These connectors are available from several manufacturers with different interface types and attachment methods. A sample of the types and part numbers is shown in Table 1 below. Connectors for the 0.240" diameter cable are also shown in the table. The 0.590"-diameter cable has a non-standard dielectric diameter, so our company has worked with several manufacturers to design connectors for it. The connector types available include N-male, N-female, UHF-male and 7/16 DIN male in both crimp

and clamp-solder configurations. These connectors are available from distributors that handle the cables.

Applications for the new cables range from short jumpers between ports on a combiner, to longer jumpers between combiners and radios, to feeder runs up towers. Their combination of low-cost, excellent electrical and mechanical properties and ease of handling make them good choices for many applications where corrugated copper cables have been used.

For example, a large radio manufacturer has selected the new 0.590"-
diameter foil-braid cable to replace a 10-foot jumper previously fabricated from 1/2"-diameter "superflexible" corrugated-copper cable in a 220 Mhz system. The 0.590" cable is nearly as flexible as the 1/2" "super flexible" corrugated-copper cable, but it has a loss of only 1.2dB/100 ft at 220 Mhz compared to loss of 1.6dB/100 ft for the 1/2" corrugated-copper "superflexible" cable. The new cable's loss is almost as low as that of a 1/2" low-density foam-dielectric cable that has loss of 1.05dB/100 feet at 220 Mhz.

The list price of the 0.590"-diameter foil-braid cable is $1.20 perfoot. The type-N male crimp connectors used on this assembly are $14.50 each (list price).

Several trunked radio system operators are planning to use the 0.590"-diameter cable for short antenna feeder runs at 900 Mhz in applications where they previously have used 1/2"-diameter, low-density, foam-dielectric corrugated-copper cable. The attenuation of the 0.590" cable is slightly higher-2.5dB/100 feet at 900 Mhz-compared to 2.2dB/100 feet for the 1/2"-diameter corrugated-copper cable, but the 0.590" foil-braid cable costs less ($1.20/foot, list) and is more flexible. The standard hangers and grounding straps sold for the 1/2"-diameter corrugated-copper cable also work with the 0.590" foil-braid cable.

A large manufacturer of paging equipment is evaluating the replacement of 1/4"-diameter and 1/2"-diameter corrugated-copper "superflexible" cables with the new 0.405" and 0.590" cables, respectively. For a 20-foot assembly, the material cost is $53 for the foil-braid cable and connectors. At 450 Mhz, the 0.590"-diameter cable has 1.7dB/100 feet loss, compared to 2.3dB/100 feet for the 1/2"-diameter corrugated-copper cable.

The comparison is similar between the 1/4"-diameter corrugated-copper cable and the 0.405"-diameter foil-braid cable. Loss at 450 Mhz is 2.7dB/100 feet for the 0.405" foil-braid cable, compared to 3.9dB for the 1/4" corrugated-copper cable. Cost of materials for a 20-foot assembly is $35 for the foil-braid cable and connectors.

The development of the additional sizes of the new cables, including 7/8" diameter and 1 1/4" diameter, will provide additional choices in the selection of low-loss cables. These products have been introduced and are in field trials.

As technology has advanced, radio and antenna prices have decreased dramatically over the last few years, whereas the costs of low-loss cables have continued to escalate, and the cable technology has stalled. These new cables represent the first important advance in low-loss cables in more than 10 years. Cost-effective alternatives such as these will help to ensure the growth and the health of the mobile communications industry.

ATV IN SPACE: RR0DL on MIR

Not a single Mark would Prof. Heinz Kaminski DJ5YM have betted back on 4th October 1957, as he received signals from Sputnik, the world's first artificial satellite in his shack, that one day amateurs might be installing amateur television equipment aboard a Russian space station...

But it was an almost insoluble problem of time that Heinrich Spreckelmann DC0BV reported by telephone on 11th February 1994. He was reporting a discussion held in Kaliningrad, Russia the previous month.

Flashback

Members of the AG-ATV (Bremen University ATV Group) had, under the leadership of DC0BV, already been involved in space experiments since 1985 when they developed the antenna for the Spacelab D1 mission amateur radio experiment. The next year they conceived the idea of and ATV experiment on the D2 mission, although in the event factors ruled against this. Although their chief interest was a full-fledged ATV experiment, they also modified a commercial 70cm handheld FM transceiver for space operation.

Prospect

Now at last arose a chance for Europe to turn this ATV-in-space experiment into reality. Within the framework of the SAFEX-II amateur radio experiment on the Russian space station MIR, the Bremen group had the opportunity to take part and provide an ATV link between the station and earth. Between them Thomas Kieselbach DL2MDE and the Russian experts evolved a scheme.

In spring 1995 a capsule called Priroda will be fired into orbit and docked onto MIR. By this time the following items must be developed, built and tested:

(1) the combination 13/23cm antenna,
(2) the antenna splitter,
(3) a 23cm preamplifier, and
(4) the PA for 13cm.

Since they will be carried outboard in space, they must be qualified for this environment.

Work, work and more work. A high degree of effort will be required selecting the most appropriate designs, collecting suitable materials and completing everything by the time deadline. The next step is developing and buildingthree times over the units required for the ATV transponder 'down here'. There are so many possibilities: should the camera be mounted fixed by a window, to view the world from space, or should it be used to provide visible contact with an astronaut (who hopefully speaks English). An even more exciting prospect is making Europe-wide contacts in amateur

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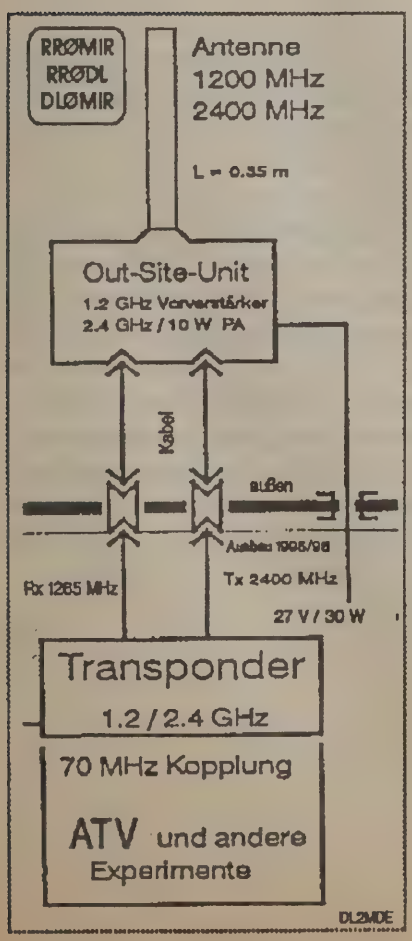
television, although this will not be all that easy - the flight passage of the spacecraft is such that a pass will last a maximum of 20 minutes and antennas will require constant (motorized) tracking, although Manfred Fuetterer DC6FM has devised a computer control system for this. If a group of amateurs did this and linked in some ATV repeaters a kind of ATV broadcast from space would be possible. Quick tempo Time is pressing and the tests must proceed. To support the efforts of the Bremen group there are many opportunities for amateurs, firms and institutes to donate cash, ideas or materials. (Original report by Heinz Venhaus DC6MR, English version by Andy Emmerson, G8PTH)

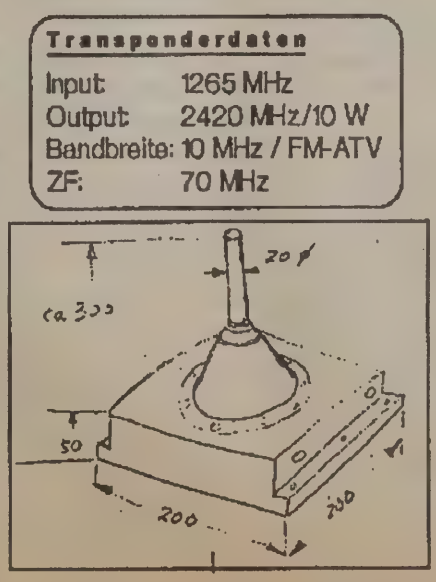
TINTED PANEL:

TRANSPONDER DETAILS

Input 1265 MHz Output 2420 MHz, 10 watts.

Bandwidth 10 MHz, FM-ATV IF 70 MHz.





Skizze der Außeneinheit von DCØBV

THE DECIBEL (dB)

The word is simple enough, hard to mispronounce, essential in electronic calculations, but not very well understood by most that come in contact with it. It has been used most irreverently pluralized, garishly acronemed, deplorably phoneticized and most of the times misquoted. So, what is it, and why is the "B" in dB always capitalized? If you don't know, you certainly need to.

Alexander Graham Bell, in the mid 1800's, was conducting research in the area of sound power associated with the human ear. He established a unit that described a unit of sound intensity and called it a Bel.

Sound Intensity (Bel) = (I/I_o).

I = The intensity level of interest,

I_o = The threshold of hearing, $(10^{-12} W \cdot m^{-2})$

Note: The decibel is always a power ratio!

We can make reference to voltage and current ratios in dB also. However, then the dB must then be subscripted.

dBV or dBI = 20 Log V_2/V_1 for voltage or current.

Note: Do not confuse dBI with dBi.

It looks a little different than $dB_{(POWER)}$ for some reason. Why? Because the voltage AND current ratios must be derivated to a power ratio first. Remember, $P = E \cdot I$, $P = E^2/R$ or $E = (P \cdot R)^{-2}$ and $P = I^2 \cdot R$ or $I = (P\ R)^{-2}$ There exists a squared term when converting voltage or current to dB and therefore we must use 20 times the log of the ratios. Remember the log of a squared term is two times the size of the term. The following is a little exercise to bear this out. You will probably recall seeing this explanation in Math 101;

$\log (A \cdot B) = \log A + \log B$

$\log (A)^2 = \log A + \log A$

$\log (A)^2 = 2 \log A$

If $x = 10 \log a/b$, then $2x = 2 \cdot 10 \log (a)/b$.

As a real world example, let's look at a power reduction of from 10 watts to 5 watts;

$dB = 10 \log 5/10$

$dB = 10 \log 0.5$

$dB = 10 \cdot -0.3010$

$dB = 03.010$ or 03 dB

In the case of voltage, a reduction of 10 volts to 5 volts;

$dB = 20 \log 5/10$

$dB = 20 \log 0.5$

$dB = 20 \cdot -0.3010$

$dB = -6.020$ or -6 dB.

Even though the ratios of the power and the voltage are the same in the two instances, the derivation to dB will always be 2 to 1 voltage to power. To prove this let's look at a situation where we want to know what 10 dB above 1 watt is.

$$dB = 10 \log (P_2/P_1)$$
$$10 = 10 \log x/1$$

Divide both sides of the equation by 10 and multiply by x,

$$x = \log 1,$$

and take the antilog of 1.

$$x = 10 \text{ watts}$$

Now, how about voltage? Let's explore what 10 dB is above 1 volt or $(1 \text{ volt})^2$.

$$10dB = \log E_2/E_1$$
$$10 = 20 \log x/1$$

Divide both sides of the equation by 20,

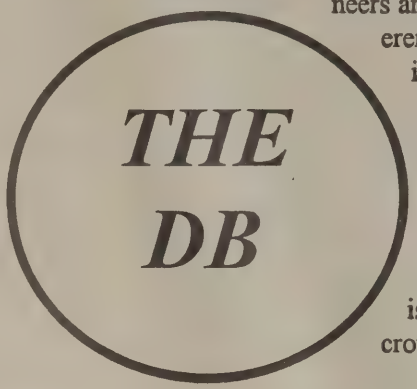
$$0.50 = \log x \log 1, (\log 1 = 0)$$

Take the antilog of both sides,

$$10^{0.5} = 10^x,$$
$$x = 3.1623,$$
$$1V \text{ raised } 10dB_{(V)} = 3.1623 \text{ volts}$$

I'd like to take the time to look at several other derivations of dB. Many times in antenna ads we see dBi, which means dB compared to an isotropic source. An isotropic source is a point source, a mathematical model that radiates perfectly in all directions and is about 2.15 dB less gain or has a directivity of about -1.64 than that of a dipole. Manufacturers simply add 2.15 dB to their actual measured gain of their product and hope that the inflated gain figure catches the eye of the unwary and entices them to buy their antenna rather than the one offered by the manufacturer that has advertised his product at let's say 10 dBd. You can make the same set up as this manufacturer and measure the gain of his product yourself. The manufacturer claiming gain over an isotropic source can only be checked mathematically. This could be a whole other article.

A derivation that is seen a lot in the broadcast field is measurements in dBc, or dB using the carrier level as a reference. Another one used in broadcast is dBw or dB above a watt. A standard adopted in electronics has been the dBm or dB referenced to a milliwatt in a 50Ù load. The derivation that is used in television, both broadcast and cable, is the dBmv. This is dB referenced to a millivolt (0.001 volt) in either a 50Ù or a 75Ù load. In the derivation from voltage to power - **BE CAREFUL** - make sure of the resistance or impedance you are dealing with. When you turn the crank on the equations, you will find that 1 mv across a 50Ù load is equal to -47 dBm, across a 75Ù load it is -108 dBm. As a reference, you might remember that 0 dBmv = -47 dbm. I have elaborated on this particular derivation of the dB because the local Denver ATV repeater has an ID that includes the signal strength of the station that is using the repeater. Because the receive portion of that repeater uses a Scientific Atlanta Cable System Front End, the signal strength is in what the cable system technicians and engineers are used to, dBmv. It is a hard reference to adapt to anything else and is pretty much useless if you are trying to do a link analysis to check out your systems performance. So, if you're into the repeater with a 0 dBmv signal, you know that it derivated to a signal strength in dBm of -47 andthat is easy enough to convert to microvolts (iv) as follows:



$$(x) \text{ dBm} - 30 = (x) \text{ dBw}$$
$$(x) \text{ dBw} = 10 \text{ Log } (x) (E^2/R)$$
$$(x) \text{ dBw}/10 \text{ antilog} = (x) (E^2/R)$$
$$((x) \cdot R)^{-2} = E$$

so that,

$$-47 \text{ dBm} - 30 \text{ dB} = -77 \text{ dBw}$$
$$(-77 \text{ dBw}/10) \text{ antilog} = 1.995 \times 10^{-8}$$
$$(1.995 \times 10^{-8} \cdot 50)^{-2} = E$$
$$E = 0.001V \text{ or } 1000 \text{ iv}$$

This may seem like a healthy signal, and it is by other standards and references, such as; our handheld 2 meter radios have a sensitivity of about 0.25 iv for 20 dB quieting or 12 dB SINAD (signa in noise and distortion).

In summary, I have let you know where the dB has come from. I have shown its usefulness, how it is used in derivations and calculations. I have presented examples and applications. Hopefully, those of you that had some doubt about what the **dB** is and how it should be used, are now more familiar with it and for goodness sake, stop referring to it a as "dog bone", good buddy. 73, Dave W6OAL

VIDEO CROSS FADER

from CQ-TV (BATC)
Bob Robson GW8AGI

Circuit Description

The circuit is designed around the ELANTEC EL4095C integrated circuit. Within the IC are two amplifiers to condition the input videos, a fader element controlled by external voltages, and the output amplifier. The two ends of the fader element are fed by two pole switches "wired" to allow the element to be fed by the two input amplifiers, or by either one being fed to both ends of the element, effectively allowing it to act as a "cut" switch.

Referring to the circuit diagram, the input videos are both fed to the non-inverting inputs of the input amplifiers, with the inverting inputs being fed from the output via gain control feedback resistors. The video 1 input also feeds to an LM1881 sync separator IC3 whose mixed sync output triggers a 74LS221 monostable.

The monostable is adjusted for approximately 12microseconds starting at the negative edge of the sync pulse. This pulse forces the switching within EL4095C to the input 1. This will cause the output to be the syncs and color burst from video 1. At the end of the LS221 pulse the output will be fed by either Input 1 or 2 or a combination of both depending on the fader control signal voltages.

The fader control voltages are +/- 0.5 volts antiphase. The control voltage is from a 1K potentiometer external to the circuit drawn (Pin 28, con 1) to set the correct swing of the control voltage two preset potentiometers feed the external control pot.

The output from the EL4095C is fed to the non inverting input of an EL2020 amplifier set up by R13 and R14 for a gain of two, with R15 providing the correct send impedance of 75R for the video output signal.

Setting Up

The fade voltages will require setting up before the EL4095C is installed. The procedure is as follows: Connect your 1k fader potentiometer (rotary or slider with a linear law (between pins 23 and 26 and the slider to pin 28. Using a high impedance meter, monitor pin 23 WRT (with respect to) pin 32. Adjust RV2 for a reading of 0.5V. Move the meter to pin 26 and adjust RV3 for a reading of -0.5V. Move the monitoring to pin 6 of IC4 (still WRT pin 32) and adjust the fader control to the pin 23 end. The voltage should be 0.5V, but due to the interaction of RV2 and RV3, there may be a small error. If there is an error, adjust RV2 and RV3 for the correct readings when the fader control is moved to the two ends. Having got the correct reading, then check that you have similar readings but of opposite polarity at pin 6 of IC5.

When the fader voltages are correct, remove the power from the unit and insert the EL4095C, and reapply power. For the next operation a video source and an oscilloscope (preferably dual trace) are required. Connect the video signal to pin 5. Monitor pin 1 of IC3. Composite syncs should be present.

Apply the video on pin 5 to trace 1 of the oscilloscope and set the display to show two lines of video. With the second channel monitor the output of the monostable (pin 4). The waveform should be a negative going pulse which starts at the negative going edge of the sync pulse. Adjust the pulse at pin 4 to be approximately 10 microseconds, i.e., it should end just before the active period of the line waveform.

Connect a monitor to the video output (pin 21 of the edge connector), and adjust the fader towards the positive end of the control. The video input to pin 5 should be displayed as a locked picture. Move the fader to the other end of its track and the picture should fade to black.

Connect a second video source, which has been locked to source 1, to pin 13. This should now be displayed on the monitor. Moving the fader should now mix between the two video sources.

If you are using two color sources and the second picture is not displaying its colors correctly, then you will have to adjust the color phasing controls on the second source to get the colors correctly. Once you have set up the correct phasing, it is a good idea to mark all the coaxial cables used so that they can be connected to the same sources/destinations if you have to break down the system. The reason for this is that adding a couple of meters of length to one of the video paths will upset the color frequency phaserelationship of the system.

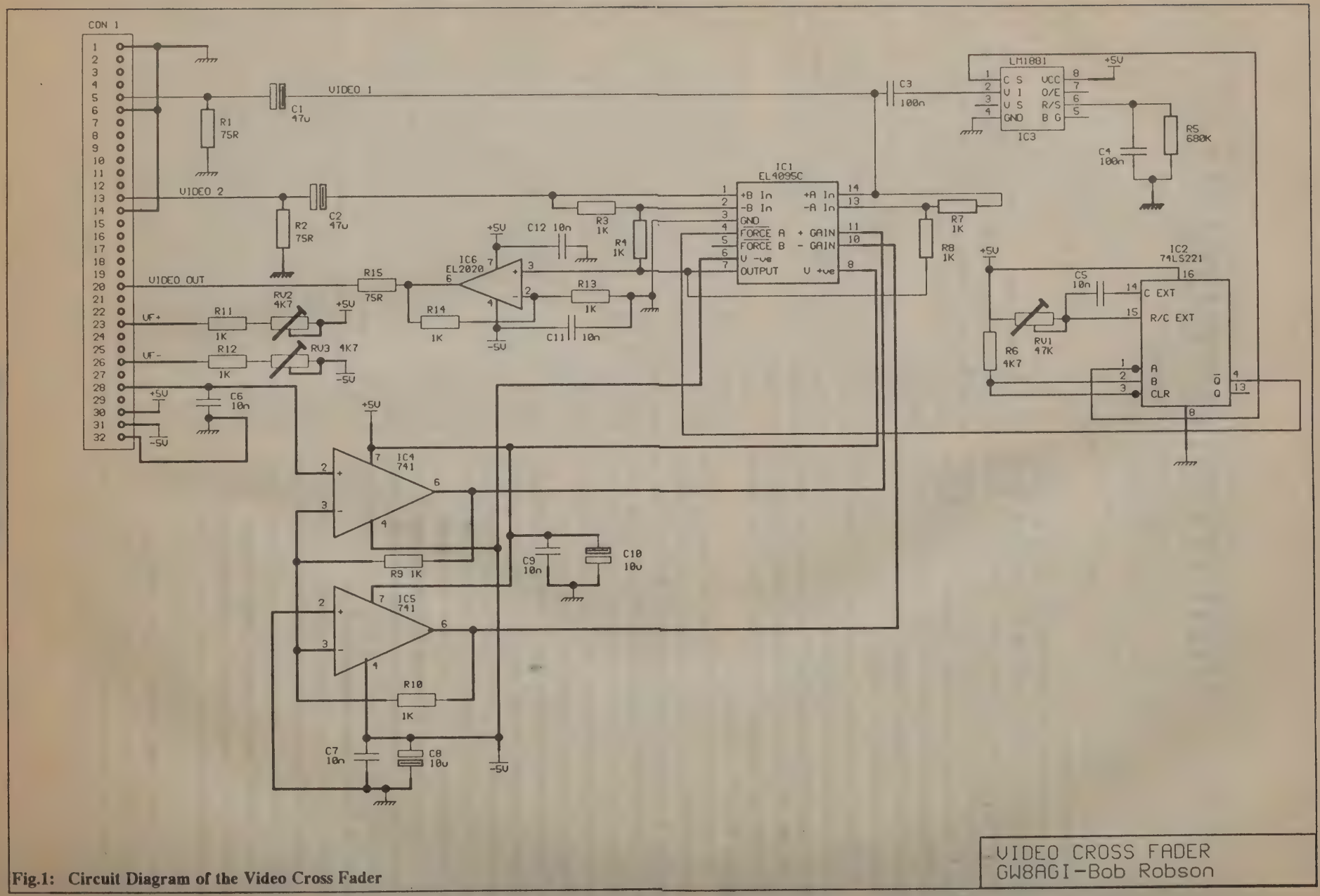


Fig.1: Circuit Diagram of the Video Cross Fader

SO YOU WANT TO BUILD AN ATV REPEATER

PART 2 - CONFIGURATION

By Mike Collis WA6SVT

In our last article we discussed sites. This article will deal with repeater configurations and equipment.

Configuration

There are two basic ways to configuration 1, integrated repeater-controller and 2, separate chassis that interconnect via a cable. My first repeater was an integrated type with receiver, transmitter and controller on one chassis with separate compartment. Integrated chassis is a good choice for portable repeater operation, but it is not well suited for expansion or network linking.

Over the last few years ATN has been building the separate chassis configuration and is also upgrading our older repeaters to this format. Some of the advantages are easy change out of transmitters, receivers and controllers with spare units to minimize time spent at the radio site. New equipment can be easily tested to see if it will provide better performance. The key to compatibility with various units is using a multipin connector such as a DB-9 to handle all audio, video, power, and control lines using a common pinout configuration. The power should be 13 volts and video at 1v p-p. Audio can be anything from -10 dBm to +7 dBm. I prefer 0 dBm @ 600 ohms. An added advantage to this design in an uncluttered appearance of the equipment rack with all but the antenna wiring consolidated into one cable.

Equipment

The building blocks to a repeater are receivers, transmitters, controllers, power supply and visual display ID unit. With different amounts of equipment you can build just about any type of repeater from a basic one input and one output repeater to multiple input repeater interlinked with other repeaters to form a network.

Controllers

ATV controllers have a sync detector that when video is present it will key a transmitter and switch the video from the ID to the receiver. It should have a hang timer and a control point to command off the video transmitter via DTMF or other means. One of the best basic controllers is the VOR-2 from PC Electronics. A more elaborate controller is the VC-100 multiple input controller. Some of the features are video scan, stops on an input upon detection of video, and DTMF control of the inputs. One of the full feature controllers is the ATN controller. It has priority video-audio selection (8 separate video detected inputs and two non-detected inputs), link control, system status that updates the ID computer as to what inputs are active and the input that is currently selected to feed the repeater transmitter. It has DTMF decoder to control ATV as well as controls the voice control repeater and a two meter base station. Network interconnection works best with priority because it will allow the local repeater to have its own input over the ride the link automatically.

A quick to assemble priority controller can be made by interconnecting two or more PC Electronics VOR-2 boards together as follows: first connect the video output of board "A" to the receive video in on board "B". Next parallel a small double through relay with its coil across the video switch relay on board "A" (coil should have the same rating as the one on the board). The relay will control the audio at the same time the video is switched. Configure the VOR-2 as a repeater controller as directed on the paperwork supplied by the manufacture. ID (AUX) input on board "B" connect to a ID video source. The output to the ATV repeater transmitter, with the common contact of the added relay to line audio in on the transmitter. Board "A" will switch between the priority one and two inputs, receive in on board "A: is priority one for video and normally open contact on the added relay is audio in. ID (AUX) input and normally closed relay contact on the added relay is for priority two. You may want to defeat the 10 minute ID timer on board "A" so a few seconds of videowill not be lost every 10 minutes during ID time. Hook up the keyed 12 volts from board "B" to the power input on the ATV exciter.

Receivers

Television receivers (demodulators) come in two modes, AM or FM with some variations within each mode. We will discuss the variations and cover the down converter later in this article.

SO YOU WANT TO BUILD AN ATV REPEATER

AM Demodulator

Two types are used and they are the envelope detector and synchronous detector. An envelope detector is the type that most older TV sets and new low end TVs use. It is similar to the type used in AM broadcast receivers. The detector is usually a diode or IC and is followed by a low pass filter to remove any remaining IF carrier. Envelope detectors have a flaw in the demodulation process, crosstalk between the luminance and color portions of the signal is generated. This flaw can be reduced to a usable level by reducing the gain of the IF response with the IF filter or an external slope filter, but cross talk is still at about three percent. The high resolution and color information is brought back up after demodulation by video peaking in the video output circuit at a loss of video signal to noise ratio.

To overcome this crosstalk problem, a more sophisticated demodulator was developed, the synchronous detector. Crosstalk is reduced to unmeasurable levels and the differential phase and gain are also reduced. It uses a phase lock loop oscillator locked to the video carrier via a narrow filter and is done at the horizontal sync time to remain stable, this feeds one port of a balanced (synchronous) demodulator and the IF feeds the other port. The output is low pass filtered to remove any remaining IF carrier. A bonus to this demodulator is that the 45.75 MHZ phased locked oscillator can be used to mix with a filtered 41.25 MHz sound carrier to produce direct audio IF of 4.5 MHz. It is independent to change in video modulation, audio signal to noise ratio is improved. This detector is susceptible to incidental phase noise (FM on the video carrier). On carrier sound is not suggested.

If Filters

Television IF filters used to be LC types but now SAW (sound acoustic wave) filters are used. There are three variations. (1) Standard, it has some roll off to reduce crosstalk on the envelope detectors and a shallow notch at the sound carrier to reduce the intermodulation beat between the sound and color sub carriers (920 Hz beat, crosshatch). (2) Nyquest response - This filter usually knocks down the response amplitude near the video carrier to compensate for the additive sidebands produced in Vestigial Sideband transmissions (the IF filter on any TV set could care less if the signal is VSB or DSB because of the 6 MHz filter bandwidth). This will give a very flat frequency response to 4.1 MHz. It also has an audio shallow notch to reduce the 920 beat. This filter is usually found on synchronous detectors. Nyquest response filters can be used on envelope detector IFs but an external slope filter is needed to reduce the response in the color frequency area. Apparent sensitivity is 6 dB lower compared to the non-Nyquest filter.

The last filter is a hybrid type that separates the sound IF from the picture IF before amplification and can be with or without the Nyquest response. High performance receivers can be built around this filter. Slight improvement in signal to noise ratio and adjacent channel interference rejection is due to a 5 MHz bandwidth covering the video IF. The audio carrier is filtered separately through a narrow filter and can be amplified without going through the typical sound notch. When used with a synchronous detectors PLL oscillator, excellent direct audio is produced. An added bonus is reduction of the 920 beat and a ceramic 4.5 MHz sound trap is not needed and upper frequency response is improved at 4 MHz.

Television Audio

Audio on television is FM, the IF is 4.5 MHz. The sound IF is picked up after video detection except in a few end designs. It is filtered through a single ceramic two pole filter where it is demodulated by a discriminator or quad detector. To improve IF selectivity and sensitivity, the output of the ceramic filter can be pulled up and fed to the base of a 2N5179 transistor and the collector fed to two more filters in cascade before connecting it to the FM demodulator. Because commercial television uses a stronger audio carrier than most ATV transmitters, this adds a worthwhile improvement in performance. An added bonus is that noise squelch works very well after this modification. See 4.5 MHz IF circuit in thisarticle.

FM Demodulators

Two types are used in television, one is the Phase Lock Loop and the other is the Quadature detector. Both types use limiters to clip off most of the AM noise as well as eliminate the need for AGC to maintain signal level. This is one of the ways an FM demodulator maintains good signal to noise ratios at low signal levels compared to AM demodulators. 4 MHz deviation standard FM receivers can usually support up to four sub carriers or a digital DS1 rate carrier above the video. While 11 MHz deviation (satellite) standard FM receivers can support large amounts of subcarriers or very wide band video.

Phase Lock Loop demodulators track the video carrier and the correction voltage becomes the video. This type of demodulator has the added benefit of some AFC action. Alignment usually requires setting the oscillator frequency on the PLL to the center IF frequency.

SO YOU WANT TO BUILD AN ATV REPEATER

Quadature demodulators have been around for a long time and work by having two tuned circuits, one tuned to the high side of the IF and the other set to the low side of the IF. A diode detector is connected to each circuit, positive out of the high side and the negative output to the low side. The outputs of the detectors are summed together so when the IF is centered the output is cancelled. When the frequency is lowered the output goes negative and raising the frequency above the center produces a positive output. Alignment is more involved than PLL demodulators.

FM IF Filters

Old designs used LC filters, but most manufacturers now use SAW filters. IF frequencies used to be 70 MHz, but now 118,140 and 540 MHz are common as well. Filter bandwidth for wide band FM (11 MHz deviation) is normally 36, 30 or 26 MHz. Narrow FM (4 MHz deviation is used for terrestrial use) uses 20, 17 and 12 MHz filters. A 20 MHz filtered receiver can handle up to 9 MHz of base band (video) signal, 17 MHz filter can handle up to 7.5 MHz and 12 MHz filters can handle up to 6 MHz. Remember to choose your subcarrier frequencies based on the baseband bandwidth. To further filter off noise, a de-emphasis filter is used. This requires the signal to be already pre-emphasized.

Down Converters

Down converters usually have some preselection filtering to reduce out of band signals from overloading the RF amplifier. Next is the RF amplifier (LNA). This stage is low noise and sets the main noise figure of the receiver. GaAsFETs usually make the best low noise and inter-modulation resistant amplifiers.

Bipolar and FETs are not as good. MMIC (MAR) amplifiers are easy to use as they are 50 ohm units, however, they do not have the best noise figures. Three types of mixers are used. (1) Active, it has gain, low noise figure, but suffers from poor inter-modulation distortion when strong signals fall within its pass band or near it. RF, IF and oscillator isolation is usually poor with this mixer as well. (2) Passive filters are better at inter-modulation, but have loss usually about 6 to 8 dB. Double Balanced Mixers are the best type of mixers as most are 50 ohm and have good isolation between the ports. They have about 8 dB of loss.

Image reject mixers have become popular with the satellite receivers as this eliminates the need for a tracking bandpass filter. It works by splitting the RF signal in a 90 degree hybrid with each leg feeding a balanced mixer, the local oscillator feeds the mixers in phase and the IF port on each mixer is fed to another 90 degree hybrid before becoming the IF signal. This type mixer sees the desired signal in phase from each mixer and the image frequency is out of phase and cancels.

Local oscillators can be as simple as a VFO or as complicated as a PLL. In repeater service either a PLL or crystal is the best oscillators to use. The LO should be clean or be filtered and if used with a double balanced mixer, should have +7 dBm drive for most DBMs (some need only +3 dBm and high inter-modulation resistant ones need as much as +23 dBm).

Mixers should have a filter of at least three tuned circuits or poles ahead of it to reduce image noise and out of band signals. (Image noise can degrade the receiver by 3 dB if not filtered.) The RF amplifier should have enough low noise gain to overcome the loss of the mixer, filter at the mixer and the first IFs noise figure by about 6 dB. A MMIC like a MAR-3 or 6 will work well for a second RF amplifier if more gain is needed. Too much amplification before the mixer is death to a receiver at a repeater site. Because of all the high power signals at the repeater site, I always use a channelfilter ahead of the down converter. (Channel filters are advertised by a few manufacturers in ATVQ.)

In long antenna cable runs at repeater sites with 1.5 dB or more loss, you might consider mounting the channel filter and RF preamplifier in a weather tight box (NIMA works well) and tower mount it.

Receiver Performance

AM receivers are the most spectrum efficient at 6 MHz occupied bandwidth.

FM receivers have an occupied bandwidth of 17 MHz.

AM sensitivity for snow free is -66 dBm for standard filter and -60 dBm for Nyquest filtered receiver.

FM sensitivity for snow free is -87 dBm for a 20 MHz filter and -89 dBm for 12 MHz filtered receiver.

WHEEL ANTENNAS!

70 cm Little Wheel
420-450 Mhz: ATV or 432.1 SSB

900 Mhz Nano Wheel
ATV

23 cm Mini Wheel
ATV

13 cm Micro Wheel
Horizontally Polarized
Beacons
All Stackable!

$39.95 ea.
any band

Mag Wheels: Magnetically-Mounted Versions Of The Above Antennas: **$59.95**

Olde Antenna Lab
4725 W. Quincy · Denver, CO · 80236
(303) 798-5926

SO YOU WANT TO BUILD AN ATV REPEATER

Snow free is based on 37 dB video signal to noise (VHS VCRs are 42 dB S/N) and a receiver noise figure of 2.5 dB. These figures are broadcast standard as indicated in the equipment specifications and measured with accurate test equipment at the TV station where I work.

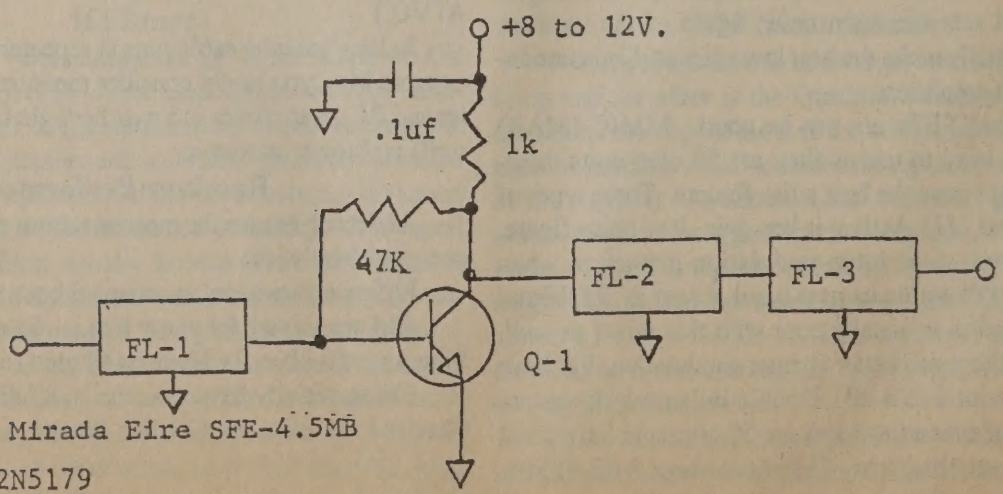
Well, now that you have so many choices in receivers, which receiver to use? Let's talk link receivers first. FM is my first choice if adequate spectrum is there to support it. I would suggest the 12 MHz wide filter as the ham band is crowded. In some parts of the country up to two subcarriers can be used. In open areas the 17 MHz filters work well and allow up to four subcarriers to be used. FM also gives a better fade margin for the same amount of signal compared to AM.

AM will work fair for links, but I would use the Nyquest filtered synchronous demodulator for the least distortion and full color response. Otherwise by the time two or more are linked, color will be lost or will be weak. Use standard filtered AM receivers as a last resort.

The main ATV receiver Type you choose may depend on your existing activity. An AM receiver with partial Nyquest response is the best compromise between weak signal and color level. Another option is to have one IF with and the other without Nyquest tied to the same down converter. The Nyquest receiver can have an AGC squelch to mute the video at P-2 and assign its output to a priority that is above that of the standard filtered IF. Now you can have the best of both. Some areas of the country are adding FM to the repeater to improve the quality of the picture.

Next issue of ATVQ we will cover Transmitters, Antennas, beam benders (boosters) and translators to extend the range of your repeater. So keep that phosphor glowing and your ATVQ subscription current! 73's Mike Collis WA6SVT, ATN.

4.5 MHz IF amplifier



Filters..... Mirada Eire SFE-4.5MB

Q-1.....2N5179

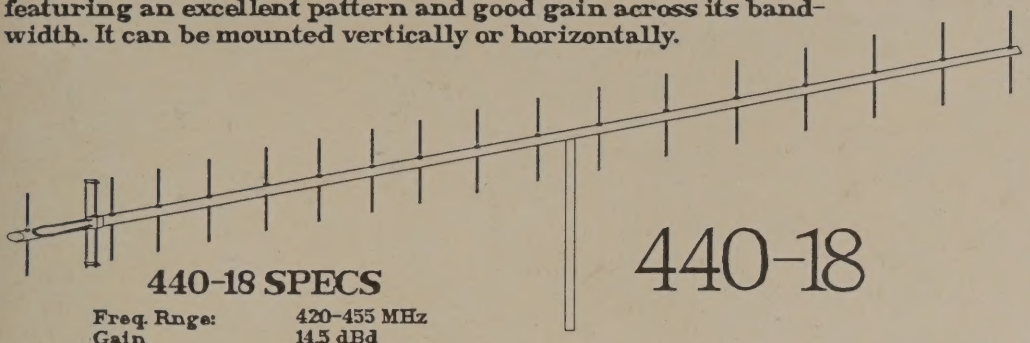
Resistors...1/4 or 1/8 watt carbon

Capacitor is disc

The 440-18 is a carefully computer optimized broadband yagi featuring an excellent pattern and good gain across its bandwidth. It can be mounted vertically or horizontally.

OTHER ANTENNAS OF INTEREST FOR ATV USE!

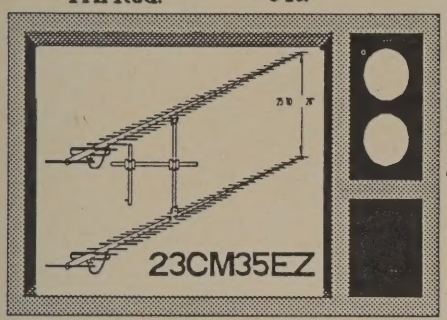
420-450-11
420-5-5
432-9WL



440-18

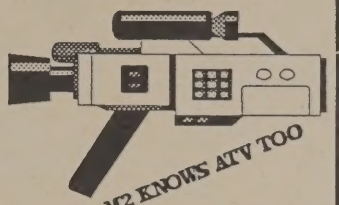
440-18 SPECS

Freq. Rnge:	420-455 MHz
Gain	14.5 dBd
Frt to bck.	23 dB
W. Area	.875 sq. ft.
Boom Lg	11.33 ft.
Trn Rad.	6 ft.



23CM35EZ SPECS

Freq. Range	1250 to 1300
Gain	18.4
Frt to Bck	25 dB
W. Area	0.6 Sq. Ft
Boom Lng	120 in
Trn. Rad	6 Ft.



ATV

Is important to us!

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7560 N. Del Mar Fresno, CA 93711
(209) 432-8873 FAX (209) 432-3059

VISA

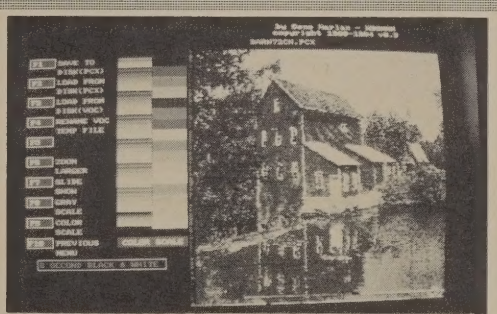
NEW!! COLOR SLOW SCAN TV for the Sound Blaster!

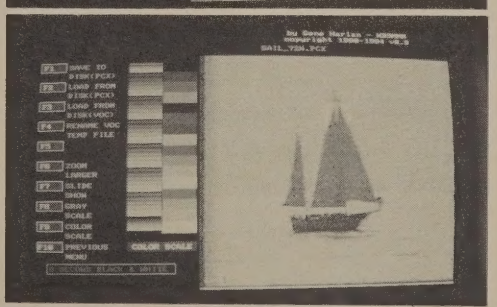
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Analyze audio signals such as SSTV, RTTY, Amtor, and Packet radio. Copy live or from a .VOC file.
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ELECTRONICS

TC70-10 ATV TRANSCEIVER

All in one box

VALUE PLUS
QUALITY
FROM OVER
25 YEARS
IN ATV



ONLY
$499 **delivered**

≥10 Watts
p.e.p. Out
Made in USA

TC70-10 Transceiver lets you get on right away with all the power most will need in one box - *90 Miles line of sight

- Adjustable peak envelope power RF output
 Typical range from 2 to15 Watts allows proper adjustment to fully drive the RF Concepts 4-110 or Mirage D1010-ATVN to full 100 Watts output for DX, without sync or audio clipping.
- Separate mic and line audio volume controls
 Lets you do voice over commenting on video tapes
- Rugged 7.5x7.5x2.7" black die cast alum. box
 Stands up under rough public service applications and takes up less space on the operating table than 1 Watt plus amp.
- True Final RF detected video monitor output
 lets you properly set the video gain control based on final output RF rather than low level. Camera video is at this jack during receive for focus & lighting set up before transmitting.

Front panel jacks accept composite video and line audio from your camcorder or VCR plus a low Z mic with push to look. Sensitive GaAsfet downconverter tunes whole 420-450 MHz 70cm band down to your TV channel 2, 3 or 4. Comes with one crystal you specify on 439.25, 434.0, 427.25 or 426.25. Second switch selectable crystal add $15. Requires 13.8 Vdc @ 3 Amps.

P.C. Electronic pioneered the ATV transceiver in 1977 with the 10 Watt TC-1. While the change in 1985 to the 1.5 Watt units gives the flexibility of selecting 15, 50 or 70 Watts depending on the situation, many long time ATVers said they missed the old 10 Watter which did just fine in most cases for local and repeater use - *90 miles snow free line of sight using 14 dBd beams. You've always been able to build your own 10 Watt system from some of the basic modules on page 2 (TVC-2G, TXA5-70, FMA5-F and PA5), but now we have a ready to go alternative in a rugged die cast aluminum box.

Transmitting equipment sold only to licensed Tech class radio amateurs, verified in the Callbook, for legal purposes. If newly licensed or upgraded, mail or fax copy of license. However, receiving downconverters available to all

COMPLETE 70CM ATV STATION

3/94

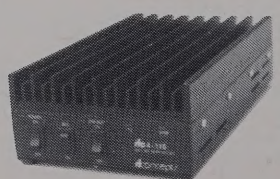


Your TV set

+



+



+





Your video camera or camcorder

+

TC70-10...$499
ATV Transceiver
10 Watts p.e.p. min.
13,8 Vdc @ 3A power supply req.
specify transmit frequency(s)

Optional 100 Watt Amplifiers
RF Concepts 4-110.....$349
Mirage D1010-ATVN ...$364
25 Amp pwr supply req.

Antennas - see pg 5
KLM 440-16X 14dBd $134
KLM 440-10X 11 dBd $74
KLM 440-6X 8.9 dBd $60
RUTLAND FO22-ATV 15.8 dBd $115

Remember when comparing prices, ours include UPS surface shipping.

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